

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE <div style="text-align: center;">J</div>		PAGE OF PAGES <div style="display: flex; justify-content: space-between;"><div>1</div><div>2</div></div>	
2. AMENDMENT/MODIFICATION NO. <div style="text-align: center;">0002</div>		3. EFFECTIVE DATE <div style="text-align: center;">11-Dec-2002</div>		4. REQUISITION/PURCHASE REQ. NO. <div style="text-align: center;">W26GLG-2317-3481</div>		5. PROJECT NO.(If applicable)	
6. ISSUED BY <div style="text-align: center;">CODE</div> CONTRACTING OFFICE (CA/CW) US ARMY ENGR DIST NORFOLK ATTN: CENAO-SS-C 803 FRONT STREET NORFOLK VA 23510-1096		DACA65		7. ADMINISTERED BY (If other than item 6) <div style="text-align: center;">CODE</div> <div style="text-align: center; font-weight: bold;">See Item 6</div>			
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X		9A. AMENDMENT OF SOLICITATION NO. DACA65-03-R-0006	
				X		9B. DATED (SEE ITEM 11) 26-Nov-2002	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) AMENDMENT NO. 0002 TO DACA65-03-R-0006, Improve Historical Housing, Langley Air Force Base, VA.							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				TEL: _____ EMAIL: _____			
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 11-Dec-2002	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this modification:

CONTINUATION

Technical plans and specifications are amended. Make appropriate changes in accordance with attached.

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DOCUMENT 00101N

BID SCHEDULES
12/97

PART 1 GENERAL

1.1 BASIS OF BIDS

1.1.1 Unit Price Schedule

This contract will be awarded as one lump sum with unit prices required for specifically selected work. A schedule of the unit price work is contained herein.

Basis of Bid for Item 0001 shall be total amount, complete in accordance with the drawings and specifications. The following unit prices shall be used to negotiate potential Change Orders for items uncovered/unforeseen during demolition and new construction.

UNIT PRICES

Note: Numbers in bold type signify a quantity amount on which to base unit cost on an individual unit basis.

Exterior - provide two (prices) for work listed below based on work ten (10) feet or below to grade or work ten (10) feet above finished grade.

1. Mortar joint repointing in accordance with Spec Section 04900, RESTORATION AND CLEANING OF MASONRY IN HISTORIC STRUCTURES.

(500) 10 feet or below	S.F. _____
(750) 10 feet or above	S.F. _____

2. Removal and replacement of damaged or missing exterior wood trim.

	10 feet or below	10 feet or above
(50) Crown Molding Trim	LF _____	LF _____
(50) 1 x 4 Trim	LF _____	LF _____
(75) 1 x 6 Trim	LF _____	LF _____
(100) 1 x 8 Trim	LF _____	LF _____

3. Removal and placement of deteriorated half-timbered wood members and wood pegs. Work shall include repair/replacement of damaged substrate and sealant along edges with dissimilar finishes.

(25) 10 feet or below	S.F. _____
(25) 10 feet or above	S.F. _____

4. Removal of damaged stucco and substrate and replacement of damaged substrate and stucco to match surrounding to remain. Include sealant along common edges to dissimilar finishes.

(50) 10 feet or below	S.F. _____
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(50) 10 feet or above S.F. _____

5. Replace wood sheathing with comparable thickness plywood. Work shall include new roofing and flashing to match adjacent finishes to remain.

(75) Asphalt Shingles S.F. _____

(75) Slate Shingles S.F. _____

Interior

6. Removal of piping and asbestos containing pipe insulation up to and including 2 inch diameter piping.

(250) L.F. _____

7. Removal of asbestos containing resilient floor tile on wood substrate. Includes removal of wood substrate and replacement with 3/4 inch thick tongue and groove plywood substrate. (Typical in attic areas.)

(200) S.F. _____

8. Removal of asbestos containing resilient floor tile and mastic on substrate to remain. (Typical in kitchens and baths.)

(125) S.F. _____

-- End of Document --

DOCUMENT 00102N

LIST OF DRAWINGS
12/97

PART 1 GENERAL

1.1 SUMMARY

This document lists the drawings for the project pursuant to contract clause "DFARS 252.236-7001, Contract Drawings, Maps and Specifications."

1.2 CONTRACT DRAWINGS

Contract drawings are as follows:

DRAWING NO.	TYPE - BUILDING NO.	TITLE	NORFOLK DISTRICT FILE NO.
<u>SOQ DUPLEX AND SINGLE (HTA)</u>			
G-001A	SOQ DUPLEX AND SINGLES - TYPES A, B, C, & D	COVER SHEET	LF 445-1.1
G-002A	SOQ DUPLEX AND SINGLES - TYPES A, B, C, & D	INDEX OF DRAWINGS	LF 445-1.2
G-003A	SOQ DUPLEX AND SINGLES - TYPES A, B, C, & D	LOCATION MAP	LF 445-1.3
C-001A	UNIT TYPES A, B, C, & D	OVERALL SITE PLAN	LF 445-1.4
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C-102A	115 & 117 BRYANT - UNIT TYPE A	SITE PLAN	LF 445-1.6
C-103A	123 & 125 BRYANT - UNIT TYPE A	SITE PLAN	LF 445-1.7
C-104A	123 & 125 BRYANT - UNIT TYPE A	SITE PLAN	LF 445-1.8
C-105A	157 & 159 DODD - UNIT TYPE A	SITE PLAN	LF 445-1.9
C-106A	161 & 163 DODD - UNIT TYPE A	SITE PLAN	LF 445-1.10
C-107A	152 & 154 EAGAN - UNIT TYPE A	SITE PLAN	LF 445-1.11
C-108A	156 & 158 EAGAN - UNIT TYPE A	SITE PLAN	LF 445-1.12
C-109A	123 & 125 GLOVER - UNIT TYPE A	SITE PLAN	LF 445-1.13
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C-114A	125 & 127 WRIGHT - UNIT TYPE A	SITE PLAN	LF 445-1.18

DRAWING NO.	TYPE - BUILDING NO.	TITLE	NORFOLK DISTRICT FILE NO.
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A-103A	SOQ DUPLEX - TYPE A	SECOND FLOOR PLAN - DEMOLITION	LF 445-1.29
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A-105A	SOQ DUPLEX - TYPE A	ATTIC PLAN - DEMOLITION	LF 445-1.31
A-106A	SOQ DUPLEX - TYPE A	ATTIC PLAN - DEMOLITION	LF 445-1.32
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A-109A	SOQ DUPLEX - TYPE A	ATTIC PLAN - DEMOLITION	LF 445-1.35
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A-217A	SOQ SINGLE - TYPE D	EXTERIOR ELEVATIONS - DEMOLITION	LF 445-1.83
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A-502A	SOQ DUPLEX AND SINGLE - TYPES A, B, C, & D	TRIM DETAILS	LF 445-1.101
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A-601A	SOQ DUPLEX - TYPE A & B	FINISH SCHEDULE - DEMOLITION	LF 445-1.109
A-602A	SOQ SINGLE - TYPE C & D	FINISH SCHEDULE - DEMOLITION	LF 445-1.110
A-603A	SOQ DUPLEX AND SINGLE - TYPES A, B, C, & D	FINISH SCHEDULE - NEW WORK	LF 445-1.111
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PM-101A	SOQ DUPLEX - TYPE A & B	BASEMENT FLOOR PLAN - PLUMBING/MECHANICAL - DEMOLITION	LF 445-1.121
PM-102A	SOQ DUPLEX - TYPE A & B	FIRST FLOOR PLAN - PLUMBING/MECHANICAL - DEMOLITION	LF 445-1.122
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PM-108A	SOQ DUPLEX - TYPE A & B	ATTIC FLOOR PLAN - PLUMBING - NEW WORK	LF 445-1.128
PM-109A	SOQ DUPLEX - TYPE A & B	ISOMETRIC RISER DIAGRAM	LF 445-1.129
PM-110A	SOQ DUPLEX - TYPE A & B	BASEMENT FLOOR PLAN MECHANICAL - NEW WORK	LF 445-1.130
PM-111A	SOQ DUPLEX - TYPE A & B	FIRST FLOOR PLAN MECHANICAL - NEW WORK	LF 445-1.131
PM-112A	SOQ DUPLEX - TYPE A & B	SECOND FLOOR PLAN MECHANICAL - NEW WORK	LF 445-1.132
PM-113A	SOQ DUPLEX - TYPE A & B	ATTIC FLOOR PLAN	

DRAWING NO.	TYPE - BUILDING NO.	TITLE	NORFOLK DISTRICT FILE NO.
PM-114A	SOQ SINGLE - TYPE C	MECHANICAL - NEW WORK BASEMENT AND FIRST FLOOR PLANS PLUMBING/	LF 445-1.133
PM-115A	SOQ SINGLE - TYPE C	MECHANICAL - DEMO SECOND AND ATTIC FLOOR PLANS PLUMBING/	LF 445-1.134
PM-116A	SOQ SINGLE - TYPE D	MECHANICAL - DEMO BASEMENT AND FIRST FLOOR PLANS PLUMBING/	LF 445-1.135
PM-117A	SOQ SINGLE - TYPE D	MECHANICAL - DEMO SECOND AND ATTIC FLOOR PLANS PLUMBING/	LF 445-1.136
PM-118A	SOQ SINGLE - TYPE C	MECHANICAL - DEMO BASEMENT AND FIRST FLOOR PLANS PLUMBING - NEW	LF 445-1.137
PM-119A	SOQ SINGLE - TYPE C	WORK SECOND FLOOR PLANS PLUMBING - NEW WORK	LF 445-1.138
PM-120A	SOQ SINGLE - TYPE D	BASEMENT AND FIRST FLOOR PLANS PLUMBING - NEW WORK	LF 445-1.139
PM-121A	SOQ SINGLE - TYPE D	SECOND FLOOR PLANS PLUMBING - NEW WORK	LF 445-1.140
PM-122A	SOQ SINGLE - TYPE C	BASEMENT AND FIRST FLOOR PLANS MECHANICAL - NEW WORK	LF 445-1.141
PM-123A	SOQ SINGLE - TYPE C	SECOND AND ATTIC FLOOR PLANS MECHANICAL - NEW WORK	LF 445-1.142
PM-124A	SOQ SINGLE - TYPE D	BASEMENT AND FIRST FLOOR PLANS MECHANICAL - NEW WORK	LF 445-1.143
PM-125A	SOQ SINGLE - TYPE D	SECOND AND ATTIC FLOOR PLANS MECHANICAL - NEW WORK	LF 445-1.144
E-001A	SOQ DUPLEX - TYPE A & B	ELECTRICAL LEGEND & NOTES	LF 445-1.145
E-002A	SOQ SINGLE - TYPE C & D	ELECTRICAL LEGEND & NOTES	LF 445-1.146
E-101A	SOQ DUPLEX - TYPE A & B	BASEMENT PLAN - ELECTRICAL - DEMOLITION	LF 445-1.147
E-102A	SOQ DUPLEX - TYPE A & B	FIRST FLOOR PLAN - ELECTRICAL - DEMOLITION	LF 445-1.148
E-103A	SOQ DUPLEX - TYPE A & B	SECOND FLOOR PLAN - ELECTRICAL - DEMOLITION	LF 445-1.149
E-104A	SOQ DUPLEX - TYPE A & B	ATTIC PLAN - ELECTRICAL - DEMOLITION	LF 445-1.150
E-105A	SOQ SINGLE - TYPE C	BASEMENT & FIRST FLOOR PLANS - ELECTRICAL - DEMOLITION	LF 445-1.151
E-106A	SOQ SINGLE - TYPE C	SECOND & ATTIC FLOOR PLANS - ELECTRICAL - DEMOLITION	LF 445-1.152
E-107A	SOQ SINGLE - TYPE D	BASEMENT & FIRST FLOOR PLANS - ELECTRICAL -	LF 445-1.153

DRAWING NO.	TYPE - BUILDING NO.	TITLE	NORFOLK DISTRICT FILE NO.
E-108A	SOQ SINGLE - TYPE D	DEMOLITION SECOND & ATTIC FLOOR PLANS - ELECTRICAL - DEMOLITION	LF 445-1.154 LF 445-1.155
E-109A	SOQ DUPLEX - TYPE A & B	BASEMENT PLAN - ELECTRICAL - NEW WORK	LF 445-1.156
E-110A	SOQ DUPLEX - TYPE A & B	FIRST FLOOR PLAN - ELECTRICAL - NEW WORK	LF 445-1.157
E-111A	SOQ DUPLEX - TYPE A & B	SECOND FLOOR PLAN - ELECTRICAL - NEW WORK	LF 445-1.158
E-112A	SOQ DUPLEX - TYPE A & B	ATTIC PLAN - ELECTRICAL - NEW WORK	LF 445-1.159
E-113A	SOQ SINGLE - TYPE C	BASEMENT & FIRST FLOOR PLAN - ELECTRICAL - NEW WORK	LF 445-1.160
E-114A	SOQ SINGLE - TYPE C	SECOND & ATTIC FLOOR PLAN - ELECTRICAL - NEW WORK	LF 445-1.161
E-115A	SOQ SINGLE - TYPE D	BASEMENT & FIRST FLOOR PLAN - ELECTRICAL - NEW WORK	LF 445-1.162
E-116A	SOQ SINGLE - TYPE D	SECOND & ATTIC FLOOR PLAN - ELECTRICAL - NEW WORK	LF 445-1.163
E-601A	SOQ DUPLEX - TYPE A & B	ELECTRICAL WIRING DIAGRAMS	LF 445-1.164
E-602A	SOQ DUPLEX - TYPE A & B	FIXTURE SCHEDULE AND DETAILS	LF 445-1.165
E-603A	SOQ SINGLE - TYPE C & D	ELECTRICAL WIRING DIAGRAMS	LF 445-1.166
E-604A	SOQ SINGLE - TYPE C & D	FIXTURE SCHEDULE AND DETAILS	LF 445-1.167

ENLISTED QUARTERS

G-001B	ENLISTED UNIT TYPES A & B	COVER SHEET	LF 445-1.168
G-002B	ENLISTED UNIT TYPES A & B	INDEX OF DRAWINGS	LF 445-1.169
G-003B	ENLISTED UNIT TYPES A & B	LOCATION MAP	LF 445-1.170
C-001B	ENLISTED UNIT TYPES A & B	OVERALL SITE PLAN	LF 445-1.171
C-002B	TYPICAL UNIT LAYOUT	SITE PLAN	LF 445-1.172
C-101B	356 AND 358 HARRIS	SITE PLAN	LF 445-1.173
C-102B	352 AND 354 HARRIS	SITE PLAN	LF 445-1.174
C-103B	342 AND 344 HARRIS	SITE PLAN	LF 445-1.175
C-104B	346 AND 348 HARRIS	SITE PLAN	LF 445-1.176
C-105B	338 AND 340 HARRIS	SITE PLAN	LF 445-1.177
C-106B	332 AND 334 HARRIS	SITE PLAN	LF 445-1.178
C-107B	323, 325, 327 AND 329 HARRIS	SITE PLAN	LF 445-1.179
C-501B	DETAILS	SITE PLAN	LF 445-1.180
S-001B	ENLISTED UNIT TYPE A & B	STRUCTURAL NOTES AND ABBREVIATIONS LIST	LF 445-1.181
S-101B	ENLISTED UNIT TYPE A & B	PARTIAL FOUNDATION AND FIRST FLOOR FRAMING PLAN	LF 445-1.182

DRAWING NO.	TYPE - BUILDING NO.	TITLE	NORFOLK DISTRICT FILE NO.
S-102B	ENLISTED UNIT TYPE A & B	ROOF FRAMING PLAN	LF 445-1.183
S-301B	ENLISTED UNIT TYPE A & B	SECTIONS	LF 445-1.184
S-501B	ENLISTED UNIT TYPE A & B	TYPICAL DETAILS	LF 445-1.185
A-001B	ENLISTED UNIT TYPES A & B	GENERAL NOTES AND LEGENDS	LF 445-1.186
A-101B	ENLISTED UNIT TYPE A	BASEMENT FLOOR PLAN - DEMOLITION	LF 445-1.187
A-102B	ENLISTED UNIT TYPE A	FIRST FLOOR PLAN - DEMOLITION	LF 445-1.188
A-103B	ENLISTED UNIT TYPE A	SECOND FLOOR PLAN - DEMOLITION	LF 445-1.189
A-104B	ENLISTED UNIT TYPE B	BASEMENT PLAN - DEMOLITION	LF 445-1.190
A-105B	ENLISTED UNIT TYPE B	FIRST FLOOR PLAN - DEMOLITION	LF 445-1.191
A-106B	ENLISTED UNIT TYPE B	SECOND FLOOR PLAN - DEMOLITION	LF 445-1.192
A-107B	ENLISTED UNIT TYPE A	BASEMENT PLAN - NEW WORK	LF 445-1.193
A-108B	ENLISTED UNIT TYPE A	FIRST FLOOR PLAN - NEW WORK	LF 445-1.194
A-109B	ENLISTED UNIT TYPE A	SECOND FLOOR PLAN - NEW WORK	LF 445-1.195
A-110B	ENLISTED UNIT TYPE B	BASEMENT PLAN - NEW WORK	LF 445-1.196
A-111B	ENLISTED UNIT TYPE B	FIRST FLOOR PLAN - NEW WORK	LF 445-1.197
A-112B	ENLISTED UNIT TYPE B	SECOND FLOOR PLAN - NEW WORK	LF 445-1.198
A-113B	ENLISTED UNIT TYPE B	ROOF PLAN - DEMOLITION AND NEW WORK	LF 445-1.199
A-201B	ENLISTED UNIT TYPE A	EXTERIOR ELEVATIONS - DEMOLITION	LF 445-1.200
A-202B	ENLISTED UNIT TYPE A	EXTERIOR ELEVATIONS - NEW WORK	LF 445-1.201
A-203B	ENLISTED UNIT TYPE B	EXTERIOR ELEVATIONS - DEMOLITION	LF 445-1.202
A-204B	ENLISTED UNIT TYPE B	EXTERIOR ELEVATIONS - NEW WORK	LF 445-1.203
A-205B	ENLISTED UNIT TYPE A/B	EXTERIOR ELEVATIONS - DEMOLITION	LF 445-1.204
A-206B	ENLISTED UNIT TYPE A/B	EXTERIOR ELEVATIONS - NEW WORK	LF 445-1.205
A-301B	ENLISTED UNIT TYPE A & B	BUILDING SECTIONS - NEW WORK	LF 445-1.206
A-302B	ENLISTED UNIT TYPE A & B	WALL SECTIONS AND PARTITION TYPES	LF 445-1.207
A-303B	ENLISTED UNIT TYPE A & B	WALL SECTIONS AND PARTITION TYPES	LF 445-1.208
A-401B	ENLISTED UNIT TYPE A & B	ENLARGED PLAN AND INTERIOR ELEVATIONS - KITCHEN	LF 445-1.209
A-402B	ENLISTED UNIT TYPE A & B	ENLARGED PLAN AND INTERIOR ELEVATIONS - BATH AND LAUNDRY	LF 445-1.210
A-501B	ENLISTED UNIT TYPE A & B	CASEWORK SECTIONS AND DETAILS	LF 445-1.211

DRAWING NO.	TYPE - BUILDING NO.	TITLE	NORFOLK DISTRICT FILE NO.
A-502B	ENLISTED UNIT TYPE A & B	TRIM AND MISCELLANEOUS DETAILS	LF 445-1.212
A-503B	ENLISTED UNIT TYPE A & B	ROOF DETAILS	LF 445-1.213
A-504B	ENLISTED UNIT TYPE A & B	STAIR SECTIONS AND DETAILS	LF 445-1.214
A-505B	ENLISTED UNIT TYPE A & B	SCREEN PORCH ELEVATIONS AND DETAILS	LF 445-1.215
A-506B	ENLISTED UNIT TYPE A & B	MISCELLANEOUS DETAILS AND PHOTOS	LF 445-1.216
A-507B	ENLISTED UNIT TYPE A & B	MISCELLANEOUS DETAILS	LF 445-1.217
A-601B	ENLISTED UNIT TYPE A & B	FINISH AND DOOR SCHEDULES	LF 445-1.218
A-602B	ENLISTED UNIT TYPE A & B	DOOR DETAILS	LF 445-1.219
A-603B	ENLISTED UNIT TYPE A & B	DOOR DETAILS	LF 445-1.220
A-604B	ENLISTED UNIT TYPE A & B	WINDOW ELEVATIONS AND DETAILS	LF 445-1.221
A-605B	ENLISTED UNIT TYPE A & B	WINDOW DETAILS	LF 445-1.222
PM-001B	ENLISTED UNIT TYPE A & B	PLUMBING LEGEND, NOTES AND DETAILS	LF 445-1.223
PM-002B	ENLISTED UNIT TYPE A & B	MECHANICAL LEGEND, NOTES AND DETAILS	LF 445-1.224
PM-101B	ENLISTED UNIT TYPE A & B	BASEMENT FIRST FLOOR PLANS PLUMBING/ MECHANICAL - DEMO	LF 445-1.225
PM-102B	ENLISTED UNIT TYPE A & B	SECOND FLOOR PLAN PLUMBING/MECHANICAL - DEMO	LF 445-1.226
PM-103B	ENLISTED UNIT TYPE A & B	BASEMENT & FIRST FLOOR PLANS PLUMBING - NEW WORK	LF 445-1.227
PM-104B	ENLISTED UNIT TYPE A & B	SECOND FLOOR PLAN PLUMBING - NEW WORK	LF 445-1.228
PM-105B	ENLISTED UNIT TYPE A & B	ISOMETRIC DIAGRAMS	LF 445-1.229
PM-106B	ENLISTED UNIT TYPE A & B	BASEMENT & FIRST FLOOR PLANS - MECHANICAL - NEW WORK	LF 445-1.230
PM-107B	ENLISTED UNIT TYPE A & B	SECOND FLOOR PLAN MECHANICAL - NEW WORK	LF 445-1.231
PM-108B	ENLISTED UNIT TYPE C & D	BASEMENT AND FIRST FLOOR PLANS PLUMBING - NEW WORK	LF 445-1.232
PM-109B	ENLISTED UNIT TYPE C & D	SECOND FLOOR PLAN PLUMBING - NEW WORK	LF 445-1.233
E-001B	ENLISTED UNIT TYPE A & B	ELECTRICAL LEGEND & NOTES	LF 445-1.234
E-101B	ENLISTED UNIT TYPE A & B	BASEMENT PLANS ELECTRICAL - DEMOLITION	LF 445-1.235
E-102B	ENLISTED UNIT TYPE A & B	FIRST & SECOND FLOOR PLANS ELECTRICAL - DEMOLITION	LF 445-1.236
E-103B	ENLISTED UNIT TYPE A & B	BASEMENT PLANS ELECTRICAL - NEW WORK	LF 445-1.237
E-104B	ENLISTED UNIT TYPE A & B	FIRST & SECOND FLOOR PLANS ELECTRICAL -	

DRAWING NO.	TYPE - BUILDING NO.	TITLE	NORFOLK DISTRICT FILE NO.
E-601B	ENLISTED UNIT TYPE A & B	NEW WORK ELECTRICAL WIRING DIAGRAMS AND PANEL SCHEDULE	LF 445-1.238
E-602B	ENLISTED UNIT TYPE A & B	FIXTURE SCHEDULE	LF 445-1.239 LF 445-1.240

1.3 SUPPLEMENTARY DRAWINGS

These supplementary drawings may not be a part of the contract but are included with the drawings for information.

1.3.1 Boring Logs

Subsurface data, not specified or indicated, have been obtained by the Government at this station. The data are available for examination by prospective bidders in the office of the Contracting Officer at the station.

1.3.2 Subsurface Data

Subsurface data, not specified or indicated, have been obtained by the Government at the station. The data are available for examination by prospective bidders in the office of the Contracting Officer at the station.

-- End of Document --

SECTION 01005

PROJECT WORK REQUIREMENTS AND RESTRICTIONS
07/00

PART 1 GENERAL

1.1 DEFINITIONS

- a. Facility: The facility is Langley Air Force Base, Virginia.
- b. CO: Contracting Officer or his authorized representative.

1.2 COOPERATION WITH USING AGENCY AND OTHER CONTRACTORS

During the period of this contract, other contracts may be in force for the construction of other features of work on or adjacent to the site of work being accomplished under this contract. It shall be the responsibility of the Contractor on this contract to be fully informed of the extent of the limits of work to be performed by other Contractors. Should there be any conflict between these limits, it shall be brought to the attention of the Contracting Officer and the CO's decision shall be final. Also, prior to completion of work under this contract, members of the Using Agency may be performing work or occupying facilities on or adjacent to the area. The Contractor shall arrange his plant and shall schedule and perform this work so as to effectively cooperate with all other Contractors and Government agencies.

1.3 PERSONNEL RESTRICTIONS

Personnel are limited to the immediate site areas and shall not enter buildings or facilities not involved in the work. All employees of the Contractor will be subject to all rules and regulations of the Facility which pertain to personnel. The Contractor shall erect fences and signs as specified and be responsible for the restrictions of all personnel. The Contractor's plans for restricting personnel access to the project site shall be submitted for approval as a part of the Safety Plan (Accident Prevention Plan).

1.4 TRANSPORTATION FACILITIES

The Facility is served by an all weather surfaced road network. Road(s) within the Facility proposed to be used by the Contractor shall be subject to prior approval of the Facility authorities and such roads, if used, shall be maintained throughout construction and shall be restored to as good condition as existed prior to their use. Any such temporary construction shall be removed and the affected area restored to its original condition. All costs for the use of existing transportation facilities, for the construction of temporary facilities, and for maintenance, repair, removal and restoration shall be borne by the Contractor.

1.4.1 Use of Roads

The Contractor shall keep all roads clear of all obstructions and free of mud and other foreign materials resulting from operations. The Contractor's vehicles shall at no time follow a vehicle closer than 50 feet, and all vehicles shall pull off the road and come to a complete stop when meeting emergency vehicles and vehicles with flashing lights. Facility

speed limits and traffic controls will be observed.

1.4.2 Road Restrictions

The movement of all vehicles within the Facility shall be confined to the roads designated and shall comply with traffic regulations within the Facility. Other roads may be used only with the approval of the CO.

1.4.2.1 Cleated Vehicles

Cleated vehicles shall not be moved over surfaced roads except at the immediate site of the area where they are to be used.

1.5 COORDINATION IN WORK AREAS

1.5.1 Unoccupied Work Area

The buildings in which the Contractor is scheduled to perform the work will not be occupied during the work. However, the Contractors work activities may affect other area(s) that are occupied. All work shall be in accordance with the Contractor's work plan.

1.5.2 Maintenance of Utilities

Any active utilities, including but not limited to electricity, gas, water, sewer, heating, air conditioning, or any like service, that will require interruption or replacement in any occupied area affected as a result of the Contractors scheduled work activities, shall be temporarily provided by the Contractor at his own expense until the affected service is fully and permanently restored. All temporary method(s) of service replacement the Contractor proposes for use on this contract shall be approved by the Contracting Officer prior to commencing the work.

1.5.3 Hours of Work

The normal work hours for construction shall be from 8:00 a.m. to 5:00 p.m., Monday through Friday of each week. Any request to change these hours shall be made in writing to the Contracting Officer at least two calendar days prior to the desired day on which the change is to go into effect. The changed hours shall not go into effect until written permission has been received from the Contracting Officer.

1.5.4 Digging Permits

Contractor is responsible for obtaining all digging permits, including associated locating and marking services, in accordance with installation and local requirements, at no additional cost to the Government.

1.6 INTERRUPTIONS OF UTILITIES

1.6.1 Approval

Utility services shall not be interrupted by the Contractor to relocate, make connections, or interrupt for any purpose, without written approval of the Contracting Officer.

1.6.2 Request

Request for permission to shut down services shall be submitted in writing

to the Contracting Officer not less than 10 calendar days prior to date of proposed interruption. The request shall give the following information:

- a. Nature of Utility (Gas, L.P. or H.P., Water, Elec.)
- b. Size of line and location of shutoff.
- c. Buildings and services affected.
- d. Hours and date of shutoff.
- e. Estimated length of time service will be interrupted.

1.6.3 Service Interruptions

Services shall not be shut off until receipt of approval of the proposed hours and date from the Contracting Officer.

1.6.4 Timely Disconnections

Shutoffs which will cause interruption of Government work operations as determined by the Contracting Officer shall be accomplished during regular non-work hours or non-work days of the Using Agency without any additional cost to the Government.

1.6.5 Utilities Operation

Operation of valves on water mains will be by Government personnel. Where shutoff of water lines interrupts service to fire hydrants or fire sprinkler systems, the Base Fire Department shall be notified by the Contractor in writing 72 hours prior to the proposed interruption. The Contractor shall arrange his operations and have sufficient material and personnel available to complete the work without undue delay and shall restore service without delay in event of emergency.

1.6.6 Gas

Flow in gas mains which have been shut off shall not be restored until the Government inspector has determined that all items serviced by the gas line have been shut off.

1.7 PHYSICAL DATA

The physical conditions indicated on the drawings and in the specifications are the result of soils investigations. Soil boring data is available for review. Coordinate with Contracting Officer.

1.8 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the Contract Clause entitled "Default: (Fixed Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

- a. The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

- b. The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

1.8.1 Schedule

The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS BASED ON (5) DAY WORK WEEK

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Langley AFB	9	9	9	6	7	6	7	7	5	6	7	9

1.8.2 Records

Upon acknowledgement of the Notice to Proceed and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day.

1.8.3 Impacted Days

The number of actual adverse weather days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day in each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in the schedule of monthly anticipated adverse weather delays, above, the contracting officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the Contract Clauses entitled "Default (Fixed Price Construction)".

1.9 SITE CONTAMINATION

This site is designated a Category I site and is defined as a site that is located in a traditional non-hazardous location, such as in an administrative, recreation, or housing area and that the Government has no reason to suspect contamination. See construction drawings for suspected lead paint and asbestos contamination.

1.9.1 Compliance Requirements

The Contractor shall comply with applicable Federal, state and local laws, codes, ordinances and regulations (including the obtaining of licenses and permits) in connection with any hazardous material, substance or waste.

1.9.2 Requirements

The requirements of this clause and any act or failure to act by the Government shall not relieve the Contractor of any responsibility or liability for the safety of Government, Contractor or subcontractor personnel or property.

1.9.3 Contamination

In the event that contamination beyond that shown or specified is encountered, the Contracting Officer shall be advised immediately. The contamination shall be removed as directed and replaced with satisfactory material. Payment therefor will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES.

1.10 HISTORICAL AND ARCHAEOLOGICAL FINDS

Federal legislation provides for the protection, preservation, and collection of scientific, prehistorical, historical, and archaeological data, including relics and specimens which might otherwise be lost due to alteration of the terrain or building features as a result of any Federal construction project. Should the Contractor, or any of the Contractor's employees, or parties operating or associated with the Contractor, in the performance of this contract discover evidence of possible scientific, prehistorical, historical, or archaeological data, the Contractor shall immediately cease work at that location and notify the Contracting Officer, giving the location and nature of the findings. The Contractor shall forward written confirmation to the Contracting Officer as directed. The Contractor shall exercise care so as not to disturb or damage artifacts or fossils uncovered during excavation operations, and shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition. Any person who, without permission, injures, destroys, excavates, appropriates, or removes any historical or prehistorical artifact, object of antiquity, or archaeological resource on the public lands of the United States is subject to arrest and penalty of law. Where appropriate by reason of discovery, the Contracting Officer may order delays in the time of performance or changes in the work, or both. If such delays or changes are ordered, an equitable adjustment will be made in the contract in accordance with the applicable clauses of the contract.

1.11 EQUIPMENT-IN-PLACE LIST:

The Contractor shall maintain a list of equipment installed under the terms of the contract. In the event that the contract includes more than one building or facility, a list must be maintained for each and delivered to the Contracting Officer upon acceptance of each building or facility. Forms to be used for this purpose are included in RMS, as described in Section 01312 RESIDENT MANAGEMENT SYSTEM (RMS). The list shall include the following:

- a. Contract number
- b. Description of item
- c. Model number
- d. Serial number
- e. Capacity
- f. Name of manufacturer
- g. Address of manufacturer
- h. Condition of item
- i. Replacement cost
- j. Name of person who checked item

1.12 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE

1.12.1 Allowable Costs

Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data when the Government can determine both ownership and operating costs for each piece of equipment or equipment groups of similar serial and series from the Contractor's accounting records. When both ownership and operating costs cannot be determined from the Contractor's accounting records, equipment costs shall be based upon the applicable provisions of EP 1110-1-8, "Construction Equipment Ownership and Operating Expense Schedule," Region II. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retrospective pricing, the schedule in effect at the time the work was performed shall apply.

1.12.2 Rental Costs

Equipment rental costs are allowable, subject to the applicable provisions of the Federal Acquisition Regulations, and shall be substantiated by certified copies of paid invoices. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined using the schedule except that rental costs leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees are allowable. Costs for major repairs and overhaul are unallowable.

1.12.3 Equipment Costs

When actual equipment costs are proposed and the total amount of the pricing action is over \$25,000, cost or pricing data shall be submitted on the Standard Form 1411, "Contract Pricing Proposal Cover Sheet". By submitting cost or pricing data, the Contractor grants to the Contracting Officer or an authorizing representative the right to examine those books, records, documents and other supporting data that will permit evaluation of the proposed equipment costs. After price agreement the Contractor shall certify that the equipment costs or pricing data submitted are accurate, complete and current.

1.12.4 Marine Equipment

In determining the ownership expense for marine equipment as described in the Schedule, the average use per year shall be 8 months.

1.13 SUBCONTRACTS AND WORK COORDINATION

Contract Clauses "SUBCONTRACTS", "PERMITS AND RESPONSIBILITIES", and "MATERIAL AND WORKMANSHIP" are supplemented as follows:

a. Divisions or sections of specifications are not intended to control the Contractor in dividing the work among subcontractors, or to limit work performed by any trade.

b. Contractor shall be responsible for coordination of the work of

the trades, subcontractors, and materials.

c. The Government or its representative will not undertake to settle any difference between the Contractor and Contractor's subcontractors, or between subcontractors.

d. The Government reserves the right to refuse to permit employment on the work or require dismissal from the work of any subcontractor who, by reason of previous unsatisfactory work on Corps of Engineers projects, or for any other reason is considered by the Contracting Officer to be incompetent or otherwise objectionable.

1.14 CONSTRUCTION MANPOWER AND EQUIPMENT REPORT

The Contractor shall submit daily reports including manpower and equipment for the general and subcontractors. Forms are available from the Contracting Officer.

1.15 PROFIT

1.15.1 Weighted Guidelines

Weighted guidelines method of determining profit shall be used on any equitable adjustment change order or modification issued under this contract. The profit factors shall be as follows:

Factor	Rate	Weight	Value
Degree of Risk	20		
Relative difficulty of work	15		
Size of Job	15		
Period of performance	15		
Contractor's investment	05		
Assistance by Government	05		
Subcontracting	<u>25</u>		
	100		

1.15.2 Value

Based on the circumstances of each procurement action, each of the above factors shall be weighted from .03 to .12 as indicated below. The value shall be obtained by multiplying the rate by the weight. The value column when totalled indicates the fair and reasonable profit percentage under the circumstances of the particular procurement.

1.15.2.1 Degree of Risk

Where the work involves no risk or the degree of risk is very small, the weighting should be .03; as the degree of risk increases, the weighting should be increased up to a maximum of .12. Lump sum items will have, generally, a higher weighted value than the unit price items for which quantities are provided. Other things to consider: the portion of the work to be done by subcontractors, nature of work, where work is to be performed, reasonableness of negotiated costs, amount of labor included in costs, and whether the negotiation is before or after performance of work.

1.15.2.2 Relative Difficulty of Work

It the work is most difficult and complex, the weighting should be .12 and should be proportionately reduced to .03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Some things to consider: the nature of the work, by whom it is to be done, where, and what is the time schedule.

1.15.2.3 Size of Job

All work not in excess of \$100,000 shall be weighted at .12. Work estimated between \$100,000 and \$5,000,000 shall be proportionately weighted from .12 to .05.

1.15.2.4 Periods of Performance

Jobs in excess of 24 months are to be weighted at .12. Jobs of lesser duration are to be proportionately weighted to a minimum of .03 for jobs not to exceed 30 days. No weight where additional time not required.

1.15.2.5 Contractor's Investment

To be weighted from .03 to .12 on the basis of below average, average, and above average. Things to consider: amount of subcontracting, mobilization payment item, Government furnished property, equipment and facilities, and expediting assistance.

1.15.2.6 Assistance by Government

To be weighted from .12 to .03 on the basis of average to above average. Things to consider: use of Government owned property, equipment and facilities, and expediting assistance.

1.15.2.7 Subcontracting

To be weighted inversely proportional to the amount of subcontracting. Where 80 percent or more of the work is to be subcontracted, the weighting is to be .03 and such weighting proportionately increased to .12 where all the work is performed by the Contractor's own forces.

1.16 PROJECT PHASING REQUIREMENTS

1.16.1 General Requirements- General Officer's Quarters

All work on all General Officer's Quarters shall be completed within 912 calendar days after the Contractor receives the Notice To Proceed. The Four Star General Officer's Quarters will be turned over to the Contractor at Notice To Proceed. At any given time during the construction duration period the Contractor will have no fewer than two and no more than six General Officer's Quarters under construction. Both quarters in a duplex building will be turned over to the Contractor at the same time.

The Contractor will be given 14 days notification prior to a building becoming vacant and available for construction to commence. The Contractor shall provide the Contracting Officer a written notice seven calendar days prior to the completion of each Building.

1.16.2 General Requirements - Enlisted Quarters

All work on all Enlisted Quarters shall be completed within 730 calendar days after the Contractor receives the Notice To Proceed. At any given time during the construction duration period the Contractor will have no fewer than eight and no more than twelve Enlisted Quarters under construction. Both quarters in a duplex building will be turned over to the Contractor at the same time.

The Contractor will be given 14 days notification prior to a building becoming vacant and available for construction to commence. The Contractor shall provide the Contracting Officer a written notice seven calendar days prior to the completion of each Building.

1.16.3 Construction Duration for Individual Buildings

All work associated with each Single Family General Officer's Quarters Buildings and each Duplex General Officer's Quarters Buildings and each Duplex Enlisted Quarters Building shall be completed within 180 days after each building is turned over to the Contractor.

1.16.4 Unoccupied/Occupied Quarters

Each quarters where work is to be accomplished will not be occupied during the work. However, nearby adjacent quarters where work is not being accomplished will remain occupied. Therefore, the Contractor shall conduct his operations to cause the least possible inconvenience to the residents of the occupied quarters. Activities of the occupants in or near the scheduled work area shall not be interrupted or hampered in any way without prior written approval of the Contracting Officer. The Contractor's operations shall not cause any danger or safety hazard to the residents of the occupied quarters.

1.16.5 Submittals, Notifications, and Daily Report

The Contractor shall coordinate all submittals and notifications as required by the Langley Air Force Base Housing Office of the scheduled work areas and furnish copies of all submittals and notifications to the Contracting Officer for approval prior to commencing the scheduled work activities. All activities of the Contractor shall be noted in the Daily Report of operations on the day of the activity.

1.17 HISTORICAL PAVING

Historical concrete paving, including driveways and sidewalks, is identified on the Civil drawings. The Contractor is prohibited from driving on historical paving. The Contractor is prohibited from using historical paving for laydown or storage areas. The historical paving shall not be damaged by the Contractor's operations in any way.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01312A

QUALITY CONTROL SYSTEM (QCS)
08/01

1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320A, PROJECT SCHEDULE, Section 01330, SUBMITTAL PROCEDURES, and Section 01451A, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

1.2 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on 3-1/2 inch high-density diskettes or CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.3 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

Hardware

IBM-compatible PC with 200 MHz Pentium or higher processor

32+ MB RAM

4 GB hard drive disk space for sole use by the QCS system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

Software

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software compatible with MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

1.4 RELATED INFORMATION

1.4.1 QCS User Guide

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.4.2 Contractor Quality Control(CQC) Training

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The QCS database typically shall include current data on the following items:

1.6.1 Administration

1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of Notice to Proceed, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of Notice to Proceed from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.6.1.4 Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.6.1.5 Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC

comments, Submittal Register Status, Three-Phase Inspection checklists.

1.6.2 Finances

1.6.2.1 Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.6.2.2 Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.6.3 Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451A, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.6.3.1 Daily Contractor Quality Control (CQC) Reports.

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451A, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the Government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.6.3.2 Deficiency Tracking.

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch

list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.6.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.6.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

1.6.4 Submittal Management

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.6.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", or Section 01320A, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320A PROJECT SCHEDULE). The updated schedule data shall be included with each

pay request submitted by the Contractor.

1.6.6 Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.7 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the QCS built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

1.8.1 File Medium

The Contractor shall submit required data on 3-1/2 inch double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.8.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

1.8.3 File Names

The Government will provide the file names to be used by the Contractor with the QCS software.

1.9 MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

-- End of Section --

SECTION 01330

SUBMITTAL PROCEDURES

05/02

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Government-Furnished Information

Submittal register database and submittal management program will be delivered to the contractor, by contracting officer on 3 1/2 inch disk. Register database will have the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-04 Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal. A "G" indicates approval by contracting officer; a blank indicates approval by QC manager.

The database and submittal management program will be extractable from the disk furnished to contractor, for operation on contractor's IBM compatible personal computer with 640kb RAM, a hard drive, and 3 1/2 inch high density floppy disk drive.

1.2 DEFINITIONS

1.2.1 Submittal

Shop drawings, product data, samples, operation and maintenance data, and administrative submittals presented for review and approval. Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.2.2 Types of Submittals

All submittals are classified as indicated in paragraph "Submittal Descriptions (SD)". Submittals also are grouped as follows:

- a. Shop drawings: As used in this section, drawings, schedules, diagrams, and other data prepared specifically for this contract, by contractor or through contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate portion of work.
- b. Product data: Preprinted material such as illustrations, standard

schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate portion of work, but not prepared exclusively for this contract.

- c. Samples: Physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to portion of work, illustrating portion of work or establishing standards for evaluating appearance of finished work or both.
- d. Operation and Maintenance (O&M) Data:
Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.
The data is required when the item is delivered to the project site.
- e. Administrative submittals: Data presented for reviews and approval to ensure that administrative requirements of project are adequately met but not to ensure directly that work is in accordance with design concept and in compliance with contract documents.

1.3 SUBMITTAL IDENTIFICATION (SD)

Submittals required are identified by SD numbers and titles as follows:

SD-01 Preconstruction Submittals

Certificates of insurance.
Surety bonds.
List of proposed subcontractors.
List of proposed products.
Construction Progress Schedule.
Submittal register.
Schedule of values.
Health and safety plan.
Work plan.
Quality control plan.
Environmental protection plan.

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the

work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

Factory test reports.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

1.3.1 Approving Authority

Person authorized to approve submittal.

1.3.2 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.4 SUBMITTALS

Submit the following in accordance with the requirements of this section.

SD-01 Preconstruction Submittals

Submittal register; G

1.5 USE OF SUBMITTAL REGISTER DATABASE

Prepare and maintain submittal register, as the work progresses.

1.5.1 Submittal Register

Submit submittal register as an electronic database. Submit with quality control plan and project schedule required by Section 01450N, "Quality Control" and Section 01321N, "Network Analysis Schedules." Section 01320N, "Construction Progress Documentation." Verify that all submittals required for project are listed and add missing submittals. Complete the following on the register database:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date contractor needs approval of submittal.

Column (i) Contractor Material: Date that contractor needs material delivered to contractor control.

1.5.2 Contractor Use of Submittal Register

Update the following fields:

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.5.3 Approving Authority Use of Submittal Register

Update the following fields:

Column (b).

Column (l) List date of submittal receipt.

Column (m) through (p).

Column (q) List date returned to contractor.

1.5.4 Contractor Action Code and Action Code

Entries used will be as follows (others may be prescribed by Transmittal Form):

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

1.5.5 Copies Delivered to the Government

Deliver one copy of submitted register updated by contractor to government with each invoice request. Deliver in electronic format, unless a paper copy is requested by contracting officer.

1.6 PROCEDURES FOR SUBMITTALS

1.6.1 Reviewing, Certifying, Approving Authority

QC organization shall be responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is QC manager unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item, indicates contracting officer is approving authority for that submittal item.

1.6.2 Constraints

- a. Submittals listed or specified in this contract shall conform to provisions of this section, unless explicitly stated otherwise.
- b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.
- c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.
- d. Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.6.3 Scheduling

- a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit. All Government approved submittals shall be submitted within 63 days after Notice to Proceed.
- b. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 14 working days for submittals for QC Manager approval and 14 working days for submittals for contracting officer approval. Period of review for submittals with contracting officer approval begins when Government receives submittal from QC organization. Period of review for each resubmittal is the same as for initial submittal.
- c. For submittals requiring review by fire protection engineer, allow review period, beginning when government receives submittal from QC organization, of 14 working days for return of submittal to the contractor. Period of review for each resubmittal is the same as for initial submittal.

1.6.4 Variations

Variations from contract requirements require Government approval pursuant to contract Clause entitled "FAR 52.236-21, Specifications and Drawings for Construction" and will be considered where advantageous to government.

1.6.4.1 Considering Variations

Discussion with contracting officer prior to submission, will help ensure functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation which results in lower cost,

consider submission of the variation as a Value Engineering Change Proposal (VECP).

1.6.4.2 Proposing Variations

When proposing variation, deliver written request to the contracting officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to government. If lower cost is a benefit, also include an estimate of the cost saving. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.6.4.3 Warranting That Variations Are Compatible

When delivering a variation for approval, contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.6.4.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 7 working days will be allowed for consideration by the Government of submittals with variations.

1.6.5 Contractor's Responsibilities

- a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.
- b. Transmit submittals to QC organization in accordance with schedule on approved Submittal Register, and to prevent delays in the work, delays to government, or delays to separate contractors.
- c. Advise contracting officer of variation, as required by paragraph entitled "Variations."
- d. Correct and resubmit submittal as directed by approving authority. When resubmitting disapproved transmittals or transmittals noted for resubmittal, the contractor shall provide copy of that previously submitted transmittal including all reviewer comments for use by approving authority. Direct specific attention in writing or on resubmitted submittal, to revisions not requested by approving authority on previous submissions.
- e. Furnish additional copies of submittal when requested by contracting officer.
- f. Complete work which must be accomplished as basis of a submittal in time to allow submittal to occur as scheduled.
- g. Ensure no work has begun until submittals (requiring Government approval) for that work have been returned as "approved," or "approved as noted", except to the extent that a portion of work must be accomplished as basis of submittal.

1.6.6 QC Organization Responsibilities

- a. Note date on which submittal was received from contractor on each submittal.
- b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.
- c. Review submittals for conformance with project design concepts and compliance with contract documents.
- d. Act on submittals, determining appropriate action based on QC organization's review of submittal.

(1) When QC manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Actions Possible."

(2) When contracting officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.

- e. Ensure that material is clearly legible.
- f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is contracting officer, QC organization will certify submittals forwarded to contracting officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Certified by QC Manager _____, Date _____"
(Signature)

(2) When approving authority is QC Manager, QC Manager will use the following approval statement when returning submittals to contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is _____ approved for use.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Approved by QC Manager _____, Date _____"

(Signature)

- g. Sign certifying statement or approval statement. The person signing certifying statements shall be QC organization member designated in the approved QC plan. The signatures shall be in original ink. Stamped signatures are not acceptable.
- h. Update submittal register database as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by contracting officer.
- i. Retain a copy of approved submittals at project site, including contractor's copy of approved samples.

1.6.7 Government's Responsibilities

When approving authority is Contracting Officer, the Government will:

- a. Note date on which submittal was received from QC manager, on each submittal for which the contracting officer is approving authority.
- b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- c. Identify returned submittals with one of the actions defined in paragraph entitled "Actions Possible" and with markings appropriate for action indicated.

1.6.8 Actions Possible

Submittals will be returned with one of the following notations:

- a. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by contractor or for being incomplete, with appropriate action, coordination, or change.
- b. Submittals marked "approved" "approved as submitted" authorize contractor to proceed with work covered.
- c. Submittals marked "approved as noted" or "approval except as noted; resubmission not required" authorize contractor to proceed with work as noted provided contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until resubmittal is approved.

1.7 FORMAT OF SUBMITTALS

1.7.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to office of approving authority. Transmit submittals with transmittal form prescribed by Contracting Officer and standard for project. The transmittal form shall identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample panels and sample installations.

1.7.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.
- c. Section number of the specification section by which submittal is required.
- d. Submittal description (SD) number of each component of submittal.
- e. When a resubmission, add alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.
- f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier contractor associated with submittal.
- g. Product identification and location in project.

1.7.3 Format for Shop Drawings

- a. Shop drawings shall not be less than 8 1/2 by 11 inches nor more than 24 by 35 inches.
- b. Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
- c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
- d. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Shop drawing dimensions shall be the same unit of measure as indicated on the contract drawings. Identify materials and products for work shown.

1.7.4 Format of Product Data

- a. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.
- b. Indicate, by prominent notation, each product which is being

submitted; indicate specification section number and paragraph number to which it pertains.

- c. Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project.

1.7.5 Format of Samples

- a. Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
 - (1) Sample of Equipment or Device: Full size.
 - (2) Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
 - (3) Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.
 - (4) Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.
 - (5) Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.
 - (6) Color Selection Samples: 2 by 4 inches.
 - (7) Sample Panel: 4 by 4 feet.
 - (8) Sample Installation: 100 square feet.
- b. Samples Showing Range of Variation: Where variations are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range.
- c. Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples shall be in undamaged condition at time of use.
- d. Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.
- e. When color, texture or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.7.6 Format of Operation and Maintenance (O&M) Data

- a. O&M Data format shall comply with the requirements specified in Section 01781, Operation and Maintenance Data"

1.7.7 Format of Administrative Submittals

- a. When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply contractor's approval stamp to document, but to a separate sheet accompanying document.

1.8 QUANTITY OF SUBMITTALS

1.8.1 Number of Copies of Shop Drawings

- a. Submit three copies of submittals of shop drawings requiring review and approval only by QC organization and six copies of shop drawings requiring review and approval by Contracting Officer.

1.8.2 Number of Copies of Product Data

Submit product data in compliance with quantity requirements specified for shop drawings.

1.8.3 Number of Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to contractor.
- b. Submit one sample panel. Include components listed in technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of non-solid materials.

1.8.4 Number of Copies of Operation and Maintenance Data

Submit three copies of O&M Data to the Contracting Officer for review and approval

1.8.5 Number of Copies of Administrative Submittals

- a. Unless otherwise specified, submit administrative submittals compliance with quantity requirements specified for shop drawings.

1.9 FORWARDING SUBMITTALS

1.9.1 Submittals Required from the Contractor

As soon as practicable after award of contract, and before procurement of fabrication, forward to the Langley Resident Office, USACE, 752 Durand Loop Road, Building 1329, P.O. Drawer 65490, Langley AFB, Virginia 23665, submittals required in the technical sections of this specification, including shop drawings, product data and samples. One copy of the transmittal form for all submittals shall be forwarded to the Resident Officer in Charge of Construction. All submittals requiring Government approval shall be submitted within 63 days of Notice to Proceed.

1.9.1.1 O&M Data

Corps of Engineers will review and approve for the Contracting Officer O&M Data to verify the submittals comply with the contract requirements.;

submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

- a. In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

1.10 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.10.1 Designer of Record Approved

Designer of Record approval is required for extensions of design, critical materials, any deviations from the solicitation, the accepted proposal, or the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Contractor shall provide the Government the number of copies designated hereinafter of all Designer of Record approved submittals. The Government may review any or all Designer of Record approved submittals for conformance to the Solicitation and Accepted Proposal. The Government will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below. Design submittals shall be in accordance with Section 01012 DESIGN AFTER AWARD. Generally, design submittals should be identified as SD-05 DESIGN DATA submittals.

1.10.2 Government Approved

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Government approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer.

Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.10.3 Information Only

All submittals not requiring Government approval will be for information only. All submittals not requiring Designer of Record or Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.11 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.12 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.13 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

1.14 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.15 SUBMITTAL REGISTER

At the end of this section is a submittal register showing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor shall maintain a submittal register for the project in accordance with Section 01312A QUALITY CONTROL SYSTEM (QCS).

1.16 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled.

1.17 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only

submittals in accordance with the instructions on the reverse side of the form. These forms are included in the QCS software that the Contractor is required to use for this contract. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

1.18 SUBMITTAL PROCEDURES

Submittals shall be made as follows:

1.18.1 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.19 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

1.20 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Two copies of the submittal will be retained by the Contracting Officer and a balance copies of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

1.21 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.22 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR
(Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s).
SIGNATURE: _____
TITLE: _____
DATE: _____

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01341

COLOR/FINISH SAMPLE BOARDS

05/99

PART 1 GENERAL

1.1 SUBMITTALS

- a. Four (4) complete sets of coordinated color/finish sample boards shall be submitted to the Contracting Officer for approval within 63 calendar days after Notice to Proceed (NTP). Upon receipt of the submitted samples, a 14-day review period by the Government can be anticipated.
- b. Interior color/finish boards shall have attached samples of all interior appearance related construction items the Contractor proposes to furnish, including, but not limited to such items as interior paints; wood finishes; ceramic tile; floor coverings; wall coverings; ceiling tiles; plastic laminates; solid surface materials; signage, etc. Exterior color/finish boards shall have attached samples of all exterior appearance related construction items the Contractor proposes to furnish, including but not limited to such items as brick; mortar; paints; window and door frames; roof; soffits; gutters and downspouts; pre-cast units, etc. Each sample shall indicate color, texture, and finish and shall be identified as to type of material and area of installation. Samples shall be arranged on the board relative to the spaces they represent (e.g. locker room, gym, offices). Technical submittals on finish materials and color boards shall be submitted simultaneously so that compliance with specification requirements is demonstrated at the time of color approval. Identification of each sample shall include the transmittal number under which certification of the material represented has been submitted in accordance with the requirements of Section, SUBMITTAL PROCEDURES. Submittals shall be complete; partial submittals will not be acceptable. The sample board backing material shall be of sufficient strength to maintain its original configuration after samples have been attached to it. The Contractor shall obtain approval of the total construction color board before start of any finish work involving any item included on the color board.
- c. After receipt of final approval from the Government, the Contractor shall prepare and submit to the Contracting Officer one set of approved and corrected color/finish sample boards. Construction color boards must match those approved during design.

1.2 FORMAT

- a. Binders: Provide submittals in 8-1/2 inch by 11 inch format. Use sturdy three-ring binders of appropriate diameter.
- b. Card Stock Sheets: Sheets containing samples shall be heavy, medium gray illustration board (not white or colored) capable of supporting a four inch by eight inch quarry tile, without distorting binder release or causing sheet tear-out due to hole failure.

- c. Mounting: Loose and lost samples are a major concern. All samples must stay mounted for many months of handling. Adhesives must be appropriate for the sample. For instance, white glue is appropriate for paper or cloth and construction adhesive is good for masonry.
- d. Content: A typical color board consists of all samples, a finish schedule, floor plan, and interior elevations with each clearly indicating the location of each finish/color. Items other than material sample boards may be folded to 8-1/2 inch by 11 inch (i.e., floor plans, finish schedules etc.).
- e. Identification: Identify each sample by use, location, and manufacturer's name. Group according to the location where each used.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01355A
ENVIRONMENTAL PROTECTION
02/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. ARMY (DA)

AR 200-5	Pest Management
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 152 - 186	Pesticide Programs
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
49 CFR 171 - 178	Hazardous Materials Regulations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) U.S. Army Corps on Engineers Safety and Health Requirements Manual
WETLAND MANUAL	Corps of Engineers Wetlands Delineation Manual Technical Report Y-87-1

1.2 DEFINITIONS

1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

1.2.4 Installation Pest Management Coordinator

Installation Pest Management Coordinator (IPMC) is the individual officially designated by the Installation Commander to oversee the Installation Pest Management Program and the Installation Pest Management Plan.

1.2.4 Project Pesticide Coordinator

The Project Pesticide Coordinator (PPC) is an individual that resides at a Civil Works Project office and that is responsible for oversight of pesticide application on Project grounds.

1.2.5 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

1.2.6 Pesticide

Pesticide is defined as any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, or intended for use as a plant regulator, defoliant or desiccant.

1.2.7 Pests

The term "pests" means arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds and other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

1.2.8 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

1.2.9 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.2.10 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with WETLAND MANUAL.

1.3 GENERAL REQUIREMENTS

The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

1.4 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

1.5 PAYMENT

No separate payment will be made for work covered under this section. The Contractor shall be responsible for payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor. All costs associated with this section shall be included in the contract price. The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G

The environmental protection plan.

1.7 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, the Contractor shall submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern shall be defined within the Environmental Protection Plan as outlined in this section. The Contractor shall address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but which the Contractor considers necessary, shall be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, the Contractor shall meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.

1.7.1 Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.7.2 Contents

The environmental protection plan shall include, but shall not be limited to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
- d. Description of the Contractor's environmental protection personnel training program.
- e. An erosion and sediment control plan which identifies the type and

location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

f. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.

g. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.

h. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

i. Drawing showing the location of borrow areas.

j. The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

1. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.

2. The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.

3. Training requirements for Contractor's personnel and methods of accomplishing the training.

4. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

5. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.

6. The methods and procedures to be used for expeditious

contaminant cleanup.

k. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

l. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

m. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

n. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time shall be included in the contaminant prevention plan. As new hazardous materials are brought on site or removed from the site, the plan shall be updated.

o. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan shall include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, the plan shall include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, a copy of the permit and associated documents shall be included as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, the plan shall include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.

p. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and

protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. The plan shall include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Contracting Officer.

q. A pesticide treatment plan shall be included and updated, as information becomes available. The plan shall include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional Installation Project Office specific requirements. The Contractor shall follow AR 200-5 Pest Management, Chapter 2, Section III "Pest Management Records and Reports" for data required to be reported to the Installation.

1.7.3 Appendix

Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents shall be attached, as an appendix, to the Environmental Protection Plan.

1.8 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report shall be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor shall protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

1.9 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.10 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 ENVIRONMENTAL PERMITS AND COMMITMENTS

The Contractor shall be responsible for obtaining and complying with all environmental permits and commitments required by Federal, State, Regional, and local environmental laws and regulations.

3.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.

3.2.1 Work Area Limits

Prior to commencing construction activities, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.2.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs) as indicated on the drawings. BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Straw bales, if used, must be wrapped/bagged in filter fabric.

3.2.4 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas.

3.3 WATER RESOURCES

The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise indicated. All water areas affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

3.4 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.

3.4.1 Odors

Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.4.2 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise.

3.4.3 Burning

Burning shall be prohibited on the Government premises.

3.5 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.5.1 Solid Wastes

Solid wastes shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal option. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.5.2 Chemicals and Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Government. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

3.5.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. The Contractor shall, at a minimum, manage and store hazardous waste in compliance with 40 CFR 262. The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, State, and local laws and regulations.

The Contractor shall transport Contractor generated hazardous waste off Government property within 30 days in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. The Contractor shall dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer and the Facility Environmental Office. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility. The disposition of Contractor generated hazardous waste and excess hazardous materials are the Contractor's responsibility.

3.5.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. Storage of fuel on the project site shall be accordance with all Federal, State, and local laws and regulations.

3.5.5 Waste Water

Disposal of waste water shall be as specified below.

- a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related waste water off-Government property in accordance with all Federal, State, Regional and Local laws and regulations.
- b. For discharge of ground water, the Contractor shall surface discharge in accordance with all Federal, State, and local laws and regulations.
- c. Water generated from the flushing of lines after disinfection or disinfection in conjunction with hydrostatic testing, hydrostatic testing shall be land applied in accordance with all Federal, State, and local laws and regulations for land application discharged into the sanitary sewer with prior approval and/or notification to the Waste Water Treatment Plant's Operator.

3.6 RECYCLING AND WASTE MINIMIZATION

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

3.7 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris. The Contractor shall submit a report to the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that non-hazardous solid waste has been generated. The following shall be included in the report:

- a. Construction and Demolition (C&D) Debris Disposed = in cubic yards or tons, as appropriate.
- b. Construction and Demolition (C&D) Debris Recycled = in cubic yards or tons, as appropriate.
- c. Total C&D Debris Generated = in cubic yards or tons, as appropriate.

- d. Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount) = in cubic yards or tons, as appropriate.

3.8 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.9 INTEGRATED PEST MANAGEMENT

In order to minimize impacts to existing fauna and flora, the Contractor, through the Contracting Officer, shall coordinate with the Installation Pest Management Coordinator (IPMC) Project Pesticide Coordinator (PPC) at the earliest possible time prior to pesticide application. The Contractor shall discuss integrated pest management strategies with the IPMC and receive concurrence from the IPMC through the COR prior to the application of any pesticide associated with these specifications. Installation Project Office Pest Management personnel shall be given the opportunity to be present at all meetings concerning treatment measures for pest or disease control and during application of the pesticide. For termiticide requirements see Section 02364 TERMITICIDE TREATMENT MEASURES FOR SUBTERRANEAN TERMITE CONTROL. The use and management of pesticides are regulated under 40 CFR 152 - 186.

3.9.1 Pesticide Delivery and Storage

Pesticides shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses. Pesticides shall be stored according to manufacturer's instructions and under lock and key when unattended.

3.9.2 Qualifications

For the application of pesticides, the Contractor shall use the services of a subcontractor whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed.

3.9.3 Pesticide Handling Requirements

The Contractor shall formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions and shall use the clothing and personal protective equipment specified on the labeling for use during all phases of the application. Material Safety Data Sheets

(MSDS) shall be available for all pesticide products.

3.9.4 Application

Pesticides shall be applied by a State Certified Pesticide Applicator in accordance with EPA label restrictions and recommendation. The Certified Applicator shall wear clothing and personal protective equipment as specified on the pesticide label. Water used for formulating shall only come from locations designated by the Contracting Officer. The Contractor shall not allow the equipment to overflow. Prior to application of pesticide, all equipment shall be inspected for leaks, clogging, wear, or damage and shall be repaired prior to being used.

3.10 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

3.11 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.12 MILITARY MUNITIONS

In the event the Contractor discovers or uncovers military munitions as defined in 40 CFR 260, the Contractor shall immediately stop work in that area and immediately inform the Contracting Officer.

3.13 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.14 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". The Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area shall be graded, filled and the entire area seeded unless otherwise indicated.

-- End of Section --

SECTION 01420

SOURCES FOR REFERENCE PUBLICATIONS

02/02

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number. The designations "AOK" and "LOK" are for administrative purposes and should not be used when ordering publications.

ACI INTERNATIONAL (ACI)
P.O. Box 9094
Farmington Hills, MI 48333-9094
Ph: 248-848-3700
Fax: 248-848-3701
Internet: <http://www.aci-int.org>
AOK 5/01
LOK 2/01

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)
4301 North Fairfax Dr., Suite 425
ATTN: Pubs Dept.
Arlington, VA 22203
Ph: 703-524-8800
Fax: 703-528-3816
E-mail: ari@ari.org
Internet: <http://www.ari.org>
AOK 5/01
LOK 2/01

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)
30 W. University Dr.
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
Internet: <http://www.amca.org>
AOK 5/01
LOK 2/01

ALUMINUM ASSOCIATION (AA)

900 19th Street N.W.
Washington, DC 20006
Ph: 202-862-5100
Fax: 202-862-5164
Internet: <http://www.aluminum.org>
AOK 5/01
LOK 2/01

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

1827 Walden Ofc. Sq.
Suite 104
Schaumburg, IL 60173-4268
Ph: 847-303-5664
Fax: 847-303-5774
Internet: <http://www.aamanet.org>
AOK 5/01
LOK 2/01

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

444 N. Capital St., NW, Suite 249
Washington, DC 20001
Ph: 800-231-3475 202-624-5800
Fax: 800-525-5562 202-624-5806
Internet: <http://www.transportation.org>
AOK 5/01
LOK 2/01

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

P.O. Box 12215
Research Triangle Park, NC 27709-2215
Ph: 919-549-8141
Fax: 919-549-8933
Internet: <http://www.aatcc.org>
AOK 5/01
LOK 2/01

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

2025 M Street, NW, Suite 800
Washington, DC 20036
Ph: 202-429-5155
Fax: 202-828-6042
Internet: <http://www.abma-dc.org>
AOK 5/01
LOK 2/01

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

1330 Kemper Meadow Dr.
Suite 600
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355
Internet: <http://www.acgih.org>
E-mail: pubs@acgih.org
AOK 5/01
LOK 2/01

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)
American Wood Council
ATTN: Publications Dept.
1111 Nineteenth St. NW, Suite 800
Washington, DC 20036
Ph: 800-294-2372 or 202-463-2700
Fax: 202-463-2471
Internet: <http://www.forestprod.org/awc/>
AOK 5/01
LOK 6/00

AMERICAN GAS ASSOCIATION (AGA)
400 N. Capitol St. N.W. Suite 450
Washington, D.C. 20001
Ph: 202-824-7000
Fax: 202-824-7115
Internet: <http://www.aga.org>
AOK 5/01
LOK 2/01

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)
7012 So. Revere Parkway, Suite 140
Englewood, CO 80112
Ph: 303-792-9559
Fax: 303-792-0669
Internet: <http://www.aitc-glulam.org>
AOK 5/01
LOK 3/01

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1819 L Street, NW, 6th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
Internet: <http://www.ansi.org/>

Note --- Documents beginning with the letter "S" can be ordered from:

Acoustical Society of America
Standards and Publications Fulfillment Center
P. O. Box 1020
Sewickley, PA 15143-9998
Ph: 412-741-1979
Fax: 412-741-0609
Internet: <http://asa.aip.org>
General e-mail: asa@aip.org
Publications e-mail: asapubs@abdintl.com
AOK 5/01
LOK 6/00

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
Internet: <http://www.astm.org>
AOK 5/01
LOK 3/01

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 800-527-4723 or 404-636-8400
Fax: 404-321-5478
Internet: <http://www.ashrae.org>
AOK 5/01
LOK 3/01

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
901 Canterbury, Suite A
Westlake, OH 44145
Ph: 440-835-3040
Fax: 440-835-3488
E-mail: asse@ix.netcom.com
Internet: <http://www.asse-plumbing.org>
AOK 5/01
LOK 3/01

AMERICAN WATER WORKS ASSOCIATION(AWWA)
6666 West Quincy
Denver, CO 80235
Ph: 800-926-7337 - 303-794-7711
Fax: 303-794-7310
Internet: <http://www.awwa.org>
AOK 5/01
LOK 3/01

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
Internet: <http://www.amweld.org>
AOK 5/01
LOK 3/01

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)
P.O. Box 5690
Grandbury, TX 76049-0690
Ph: 817-326-6300
Fax: 817-326-6306
Internet: <http://www.awpa.com>
AOK 5/01
LOK 3/01

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
P.O.Box 11700
Tacoma, WA 98411-0700
Ph: 253-565-6600
Fax: 253-565-7265
Internet: <http://www.apawood.org>
AOK 5/01
LOK 6/00

ARCHITECTURAL WOODWORK INSTITUTE (AWI)
1952 Isaac Newton Square West

Reston, VA 20190
Ph: 703-733-0600
Fax: 703-733-0584
Internet: <http://www.awinet.org>
AOK 5/01
LOK 6/00

ASME INTERNATIONAL (ASME)
Three Park Avenue
New York, NY 10016-5990
Ph: 212-591-7722
Fax: 212-591-7674
Internet: <http://www.asme.org>
AOK 5/01
LOK 6/00

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K St., NW, Suite 503
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
Internet: <http://www.aabchq.com>
E-mail: aabchq@aol.com
AOK 5/01
LOK 6/00

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)
600 No. 18th St.
P.O. Box 2641
Birmingham, AL 35291
Ph: 205-257-2530
Fax: 205-257-2540
Internet: <http://www.aeic.org>
AOK 5/01
LOK 6/00

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Ave.
17th floor
New York, NY 10017-6603
Ph: 212-297-2122
Fax: 212-370-9047
Internet: <http://www.buildershardware.com>
AOK 5/01
LOK 6/00

CARPET AND RUG INSTITUTE (CRI)
310 Holiday Ave.
Dalton, GA 30720
P.O. Box 2048
Dalton, GA 30722-2048
Ph: 706-278-0232
Fax: 706-278-8835
Internet: <http://www.carpet-rug.com>
AOK 5/01
LOK 6/00

CAST IRON SOIL PIPE INSTITUTE (CISPI)
5959 Shallowford Rd., Suite 419

Chattanooga, TN 37421
Ph: 423-892-0137
Fax: 423-892-0817
Internet: <http://www.cispi.org>
AOK 5/01
LOK 6/00

COMPRESSED GAS ASSOCIATION (CGA)
4221 Walney Road, 5th Floor
Chantilly, VA 20151-2923
Ph: 703-788-2700
Fax: 703-961-1831
Internet: <http://www.cganet.com>
e-mail: Customer_Service@cganet.com
AOK 9/01
LOK 6/00

COPPER DEVELOPMENT ASSOCIATION (CDA)
260 Madison Ave.
New York, NY 10016
Ph: 212-251-7200
Fax: 212-251-7234
Internet: <http://www.copper.org>
E-mail: staff@cda.copper.org
AOK 5/01
LOK 6/00

DOOR AND HARDWARE INSTITUTE (DHI)
14150 Newbrook Dr. Suite 200
Chantilly, VA 20151-2223
Ph: 703-222-2010
Fax: 703-222-2410
Internet: <http://www.dhi.org>
e-mail: techdept@dhi.org
AOK 5/01
LOK 6/00

ELECTRONIC INDUSTRIES ALLIANCE (EIA)
2500 Wilson Blvd.
Arlington, VA 22201-3834
Ph: 703-907-7500
Fax: 703-907-7501
Internet: <http://www.eia.org>
AOK 5/01
LOK 6/00

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)
500 River Ridge Drive
Norwood, MA 02062
Ph: 781-255-6681
Ph: (Toll-Free): 877-364-6726
Fax: 781-255-0181
Internet: <http://www.fmglobal.com>
AOK 5/01
LOK 6/00

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)
University of South California

Kaprielian Hall 200
Los Angeles, CA 90089-2531
Ph: 213-740-2032
Fax: 213-740-8399
Internet: <http://www.usc.edu/dept/fccchr>
AOK 5/01
LOK 6/00

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
2945 SW Wanamaker Drive, Suite A
Topeka, KS 66614-5321
Ph: 785-271-0208
Fax: 785-271-0166
Internet: <http://www.glasswebsite.com/GANA>
AOK 5/01
LOK 6/00

GYPSUM ASSOCIATION (GA)
810 First St. NE, Suite 510
Washington, DC 20002
Ph: 202-289-5440
Fax: 202-289-3707
Internet: <http://www.gypsum.org>
AOK 5/01
LOK 6/00

HARDWOOD PLYWOOD & VENEER ASSOCIATION (HPVA)
1825 Michael Faraday Dr.
P.O. Box 2789
Reston, VA 20195-0789
Ph: 703-435-2900
Fax: 703-435-2537
Internet: <http://www.hpva.org>
AOK 5/01
LOK 6/00

HOLLOW METAL MANUFACTURERS ASSOCIATION (HMMA)

NAAMM Headquarters
8 South Michigan Avenue, Suite 1000
Chicago, IL 60603
PH: 312-332-0405
FAX: 312-332-0706
Internet: <http://www.naamm.org/hmma.htm>
AOK 6/01
LOK 0/00

NOTE --- HMMA has merged with NAAAM.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Ln, P. O. Box 1331
Piscataway, NJ 08855-1331
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-- End of Section --

SECTION 01451A

CONTRACTOR QUALITY CONTROL
05/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(2001) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(2000b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction design and construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 60 days of operation. ConstructionDesign and construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and constructionconstruction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agentssubcontractors, designers of record, consultants, architect engineers (AE), offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities must be approved by the Contracting Officer.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

- g. Procedures for tracking construction design and construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction design and construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, Postaward Conference, before start of design or construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance.

Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction

and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, show drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 5 years construction experience on construction similar to this contract and a construction person with a minimum of 10 years in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: mechanical, architectural. These individuals shall be directly employed by the prime Contractor and may not be employed by a supplier or sub-contractor on this project; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals shall have no other duties other than quality control.

Experience Matrix

Area	Qualifications
a. Mechanical	Graduate Mechanical Engineer with 2 yrs experience or person with 5 yrs related experience
b. Architectural	Graduate Architect with 2 yrs experience or person with 5 yrs related experience

Experience Matrix

Area	Qualifications
------	----------------

3.4.4 Additional Requirement

In addition to the above experience and education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors".

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 15950A HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS; 15951A DIRECT DIGITAL CONTROL FOR HVAC; 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS; or 15995A COMMISSIONING OF HVAC SYSTEMS are included in the contract, the submittals required by those sections shall be coordinated with Section 01330 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of the construction work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC

report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial

test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Special Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into

increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
- g. Offsite surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 SAMPLE FORMS

Sample forms enclosed at the end of this section. The following sample forms are included:

- a. Attachment No. 1, Guide for Listing Definable Features of Construction Work
- b. Attachment No. 2, Preparatory Phase Checklist
- c. Attachment No. 3, Initial Phase Checklist
- d. Attachment No. 4, Contractors Quality Control Report (CQR)
- e. Attachment No. 5, Test Report

3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

SECTION 01451 ATTACHMENT NO.1

GUIDE FOR LISTING DEFINABLE FEATURES OF CONSTRUCTION WORK

***** Contractor shall modify this guide to accommodate the project *****

DIVISION 1 - GENERAL REQUIREMENTS

- (a) Special Project procedures to include coordination of work, Project meetings, Submittals and Quality Control
- (b) Administrative Requirements
- (c) Environmental Protection
- (d) Historic Preservation
- (e) Job Conditions

DIVISION 2 - SITE WORK

- (a) Demolition
- (b) Removal and Disposal of Asbestos Materials
- (c) Excavation, Trenching and Backfilling for Utilities Systems to include sewer gravity drainage and water lines
- (d) Clearing and Grubbing, Backfilling for Buildings
- (e) Grading
- (f) Fence, Chain-Link
- (g) Concrete for sidewalks and Curbs
- (h) Drilled Pile Foundation
- (i) Bituminous Paving
- (j) Underground Sprinkler Systems

DIVISION 3 - CONCRETE

- (a) Concrete Materials, Concrete Procedures, Concrete Formwork, Forms, Form Ties and Accessories, Concrete Reinforcement, Concrete Accessories to Include Cast-in-Place Concrete, Specially Placed Concrete, Concrete Finishing, Concrete Curing and Grouting
- (b) Concrete Restoration and Cleaning
- (c) Precast Concrete
- (d) Electrical and Mechanical Inserts
- (e) Testing
- (f) Approval of Samples

DIVISION 4 - MASONRY

- (a) Masonry Procedures, Mortar, Mortar Accessories, Unit Masonry, Cavity Wall Construction to Include Bringing Inner and Outer Wythes Up Simultaneously, Reinforcement, Wall Ties, Flashing, Masonry Restoration and Cleaning
- (b) Acceptance of Sample Panel for Cavity Wall Construction
- (c) Composite Wall Construction
- (d) Acceptance of Sample Panel for Composite Wall Construction
- (e) CMU Partition Wall Construction to Include Prepared Openings for Ducts, Fire Dampers, Door Frames, Lintels and Bond Beams
- (f) Acceptance of CMU Partition Wall Sample Panel
- (g) Insulation and Waterproofing
- (h) Testing

ATTACHMENT NO.1 (continued)
DIVISION 5 - METALS

- (a) Structural Steel Framing To Include Metal Materials and Methods,
Metal Fastening, Metal Joints, Welding, Expansion Control and
Miscellaneous Metals
- (b) Steel Roof Decking
- (c) High Strength Bolts

DIVISION 6 - WOODS AND PLASTICS

- (a) Rough Carpentry To Include Framing, Prefabricated Structural Wood,
Fasteners and Supports, Roof Sheeting, Siding and
Sub-Flooring, Insulation and Flashing (b) Finish Carpentry To
Include Wood Treatment, Finish Flooring, Cabinets and Closets

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

- (a) Dampproofing and Waterproofing
- (b) Fireproofing
- (c) Insulation, Flashing and Sheet Metal, Roof Accessories, Sealants,
Shingles, Roof Tiles and Membrane Roofing (Built-Up and EPDM)

DIVISION 8 - DOORS AND WINDOWS

- (a) Metal Doors and Frames, Wood and Plastic Doors, Special Doors, Door
Opening Assemblies, Metal Windows, Wood and Plastic Windows,
Special Windows, Glazing and Miscellaneous Hardware, Caulking

DIVISION 9 - FINISHES

- (a) Ceramic Tile
- (b) Gypsum Wallboard To Include Special Framing, Shaft Wall Framing
System, Ceiling and Wall Opening
- (c) Acoustical Treatment to include Metal Suspension System for
Acoustical Tile and Lay-In-Panel Ceiling
- (d) Wall Covering
- (e) Carpeting
- (f) Resilient Flooring
- (g) Painting
- (h) Furring (Metal)
- (i) Plastering

DIVISION 10 - SPECIALTIES

- (a) Metal Toilet Partitions
- (b) Raised Floor System
- (c) Movable Partitions
- (d) Wardrobe
- (e) Fire Extinguisher Cabinets
- (f) Toilet Accessories

ATTACHMENT NO.1 (continued)

DIVISION 11 - EQUIPMENT

- (a) Fueling System for Motor Vehicles
- (b) Adjustable Loading Ramps
- (c) Incinerator, Packaged Controlled Air
- (d) Incinerator, Medical Waste, General Purpose, Field Erected
- (e) Food Service Equipment
- (f) Government Furnished Equipment

DIVISION 12 - FURNISHINGS

- (a) Theater Chairs
- (b) Blinds
- (c) Drapes
- (d) Lockers
- (e) Training Equipment
- (f) Furniture and Accessories
- (g) Rugs and Mats
- (h) Fabrics

DIVISION 13 - SPECIAL CONSTRUCTION

- (a) RF Shielding
- (b) Sky Lights
- (c) Swimming Pool
- (d) Energy Monitoring and Control System (EMCS)
- (e) Pre-Engineered Structures
- (f) Liquid and Gas Storage Tanks
- (g) Vaults

DIVISION 14 - CONVEYING SYSTEMS

- (a) Shaft Construction To Include Guides and Guide Rails
- (b) Car Assembly
- (c) Machine Room Layout
- (d) Entrances
- (e) Operating and Signal Devices
- (f) Fire/Emergency Power Operations
- (g) Lighting, Power and Wiring
- (h) Elevator Power Unit
- (i) Acceptance Testing To Include Communications, Safety, Weights, Emergency and Fire Operations, Dispatch System

DIVISION 15 - MECHANICAL

- (a) Insulation to Include:
 - (1) Pipes
 - (2) Ducts
 - (3) Equipment
 - (4) High Density Inserts, Insulation Protective Shields, Clips or U Bolt Supports for Multiple Pipe Hanger Supports
 - (5) Perimeter Insulation

ATTACHMENT NO. 1 (continued)

- (b) Plumbing Systems
 - (1) Waste/Vent Piping To Include: Underground Soil Piping, Above Ground Soil Piping
 - (2) Interior Piping Rough-In To Include: Galvanized Black Iron and Copper Including Drains, Fittings, Valves and Piping Supports
 - (3) Plumbing Fixtures To Include Flush Valves, Faucets and Accessories
 - (4) Cleaning, Balancing and Operational Testing
- (c) Heating systems
 - (1) Equipment and System Accessories
 - (2) Hot Water/Steam Piping Supports
 - (3) Fuel Oil/Gas Piping and Supports
 - (4) System Testing and Balancing
- (d) Air Distribution Systems
 - (1) Equipment and Accessories
 - (2) Duct Work To Include Galvanized, Aluminum, Flexible and Fiberglass, Supports, Dampers, Louvers, Diffusers, Duct Line Supports and Fire-Dampers
- (e) Refrigeration Systems
 - (1) Equipment and Accessories
 - (2) Chilled Water/Condenser Water Piping and Supports
 - (3) Refrigerant Piping and Supports
 - (4) System Testing
- (f) Automatic Temperature Control Systems
 - (1) Equipment and Materials
 - (2) Installation of Materials and Equipment
 - (3) System Testing
- (g) Underground Heat Distribution Systems
 - (1) Manholes
 - (2) Piping and Supports
 - (3) Cathodic Protection
- (h) Sprinkler Systems
 - (1) Equipment
 - (2) Piping and Supports
 - (3) Accessories
- (i) Water Treatment Systems
- (j) Welding - Piping Systems

DIVISION 16 - ELECTRICAL

- (a) Exterior Electrical Distribution, Aerial
 - (1) Pole Setting
 - (2) Placement of Crossarms, Pins, Insulators, Pole Line Hardware and Conductors
 - (3) Placement of Fuse Cutouts, Surge Arresters, Reclosers, Potheads, Pole Mounted Transformers to Include Grounding Conductors, Testing and Cable Terminations
- (b) Exterior Electrical Distribution, Underground
 - (1) Duct Line Excavation, Placement of Ducts and Misc. Materials
 - (2) Placement of In Ground Junction or Pull Boxes and Manholes
 - (3) Placement of Duct Bank Concrete Encasement
 - (4) Transformer Pad Placement
 - (5) Mounting of Pad Mounted Transformers

ATTACHMENT NO.1 (continued)

- (6) Cable Placement to Include Splicing, Fire-Proofing and Cable Terminations
- (7) Grounding Conductors and Testing
- (c) Electrical Distribution, Interior
 - (1) Wiring Methods to Include Conduit Rough-in, Raceway Boxes, Outlet Boxes, Panelboard Cabinets, Placement of Conductors and Conduit Placement Below the Slab for Slab-On-Grade Construction
 - (2) Wiring Devices, Panelboards, Switch-Boards and Lighting Fixtures
 - (3) Motors and Transformers
 - (4) Testing
- (d) Fire Detection and Alarm System
 - (1) Wiring Methods to Include Conduit, Ground Rods, Detectors, Control Panels, Power Supply, Door Holders, Audible Fire Alarm and Annunciator Panel
 - (2) Testing

---End of Attachment No.1---

SECTION 01451 ATTACHMENT NO.2
PREPARATORY PHASE CHECKLIST

CONTRACTOR'S NAME (Address)

Contract No.: _____ Date Preparatory Held: _____

Title: _____ Spec Section: _____

_____ Drawing No(s): _____

Definable Feature of Work: _____

A. PERSONNEL PRESENT:

Name	Position	Company
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

(List additional personnel on reverse side)

B. DRAWINGS AND SPECS:

I. Has each spec paragraph, contract drawing, and shop drawing been
studied? YES _____ NO _____II. Do all parties have up-to-date drawings and specifications?
YES _____ NO _____

ATTACHMENT NO.2 (continued)

C. SHOP DRAWINGS INVOLVED:

Transmittal/Item	Code	Contractor or Gov't Approval
1. _____ _____		_____
2. _____ _____		_____
3. _____ _____		_____
4. _____ _____		_____

D. MATERIALS:

I. Are all materials on hand? YES _____ NO _____

II. Have all materials been checked for contract compliance against approved shop drawings? YES _____ NO _____

III. Items not on hand or not in accordance with transmittals (if not on hand, check during initial phase):

1. _____
2. _____
3. _____
4. _____

E. TESTS required in accordance with contract requirements:

Test/Paragraph	Frequency
1. _____ _____	
2. _____ _____	
3. _____ _____	
4. _____ _____	

ATTACHMENT NO.2 (continued)

5. _____

6. _____

F. ACCIDENT PREVENTION: Has Hazard Analysis been completed?

YES _____ NO _____

If yes, attach a copy, if no, explain:

G. EQUIPMENT Requiring Operational Check:

1. _____
2. _____
3. _____
4. _____

H. WORKMANSHIP: Have procedures for accomplishing work been reviewed with appropriate people? YES _____ NO _____

I. PREVIOUS WORK: Has all preliminary work been accomplished in accordance with contract requirements and is this feature of work ready to start? YES _____ NO _____

Explain any problems: _____

ATTACHMENT NO.2 (continued)

J. HI-LIGHTING SPECIFIC ITEMS: Hi-light specific items noted during the Preparatory Phase inspection. ie, (Med. Voltage cable shall be hi-pot tested).

K. OTHER COMMENTS: _____

Quality Control Representative
Signature

SECTION 01451 ATTACHMENT NO.3
INITIAL PHASE CHECKLIST

CONTRACTOR'S NAME (Address)

Contract No.: _____ Date Initial Held: _____

Title: _____ Spec Section: _____

Drawing No(s).: _____

Definable Feature of Work: _____

A. PERSONNEL PRESENT:

Name	Position	Company
------	----------	---------

1.	_____	_____
----	-------	-------

2.	_____	_____
----	-------	-------

3.	_____	_____
----	-------	-------

4.	_____	_____
----	-------	-------

5.	_____	_____
----	-------	-------

6.	_____	_____
----	-------	-------

B. MATERIALS being used are in strict accordance with the contract plans
and specifications? YES _____ NO _____

If not, explain: _____

C. WORKMANSHIP:

I. Procedures and/or work methods witnessed are in strict compliance
with the requirement of the contract specifications? YES _____ NO

If not, explain: _____

II. Workmanship is acceptable? YES _____ NO _____

State area where improvement is needed: _____

D. SAFETY violations and corrective action taken: _____

E. COMMENTS: _____

Quality Control Representative
Signature

SECTION 01451 ATTACHMENT NO.4
DAILY CONSTRUCTION QUALITY CONTROL REPORT
(Sample of Typical Contractor Daily Quality Control Report)

SEE ATTACHMENT NO. 4 AT END OF THIS SECTION

SECTION 01451 ATTACHMENT NO.5
TEST REPORT

CONTRACTOR'S NAME (Address)

STRUCTURE OR BUILDING _____
CONTRACT NO. _____DESCRIPTION OF ITEM, SYSTEM OR PART OF SYSTEM
TESTED: __________

_____DESCRIPTION OF
TEST: __________

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR CONTRACTOR:

NAME _____

TITLE _____

SIGNATURE _____

I HEREBY CERTIFY THAT THE ABOVE DESCRIBED ITEM, SYSTEM OR PART OF SYSTEM
HAS BEEN TESTED AS INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS
REQUIRED IN THE CONTRACT SPECIFICATIONS.

SIGNATURE OF CONTRACTOR QUALITY CONTROL INSPECTOR

DATE _____

REMARKS: _____

SECTION 01451: ATTACHMENT NO. 6

DEFICIENCY TRACKING LOG

Construction Deficiency: _____

Contract No.

Safety Deficiency: _____

Project Title:

Date Reported

Description of Corrective

Reported By
Deficient WorkAction Taken
Date Corrected

Verified By

-- End of Section --

SECTION 01500
TEMPORARY CONSTRUCTION FACILITIES

07/00

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, entrance(s), utilities, and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate any supplemental or other staging area.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will not necessarily be within reasonable walking distance of the construction site. The Contractor shall provide transportation between the parking area and the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the facility.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract without charge. The Contractor shall carefully conserve any utilities furnished without charge.

1.2.2 Temporary Connections

The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall provide, install, and maintain all necessary temporary connections and distribution lines. The Contractor shall notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. After inspection and approval of the Contractor's temporary wiring installation, the Contracting Officer will then inform the Facility to make the final service connection. Under no circumstance shall the Contractor make the final electrical connection. Other utility connections shall be

made by the Contractor as directed by the Contracting Officer.

1.2.3 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer.

Government toilet facilities will not be available to Contractor's personnel.

1.2.4 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.3 BULLETIN BOARD AND PROJECT SAFETY SIGN

1.3.1 Bulletin Board

Within fifteen days after receipt of the Notice To Proceed, the Contractor shall provide a weatherproof bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract documents, Wage Rate Information poster, and other information required or approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place, outside of the contractor's temporary office, easily accessible to all employees, as approved by the Contracting Officer.

Legible copies of the aforementioned data shall be displayed until work under this contract is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

1.3.2 Safety Signs

The requirements for the sign and its content, and location shall be provided at a location designated by the Contracting Officer. The signs shall be erected within 15 days after receipt of the Notice to Proceed. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed and disposed of by the Contractor. The safety sign shall conform to the requirements as indicated on Attachment No. 2, attached hereto. Numerals, including mounting hardware shall be subject to the approval of the CO.

1.3.2.1 Project Sign

Within 15 days after receipt of Notice to Proceed, Contractor shall provide project sign as shown on attached detail at end of this section. This sign shall be located at the construction trailer/temporary office.

1.3.2.2 Payment

No separate payment will be made for the sign work covered under this section of the specifications and all costs in connection therewith will be considered as a subsidiary obligation of the Contractor, covered by the contract prices in this contract.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall

maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flag men, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

See requirements in Paragraph 1.4 of Section 01005 PROJECT WORK REQUIREMENTS AND RESTRICTIONS.

1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night. Barricades and other physical protection shall be in accordance with EM 385-1-1.

1.5 CONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices and Storage Areas

The Contracting Officer will designate an area within which the Contractor shall be permitted to place administrative or storage trailers for equipment and limited construction materials other than in trailers. The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.5.1.1 Storage Area(s)

Construction materials, trailers, and equipment shall not be stored on the project sites (around the GOQs and Enlisted Quarters). Existing materials which have been removed and are to be reinstalled shall not be stored on the project sites (around the GOQs and Enlisted Quarters). The only materials which may be stored on the project sites (around the GOQs and Enlisted Quarters) are those in support of the ongoing work in any given day. Storage area(s) for both new materials and existing materials to be reinstalled and for trailers and equipment will be as designated by the Contracting Officer. A fence around storage area(s) is not required. However, the Contractor shall be responsible for cleanliness and orderliness of the storage area(s). The Contractor will be responsible for the security of any materials and equipment stored in these areas.

1.5.1.2 Appearance of Trailers

Trailers utilized by the Contractor, whether for the purpose of administrative use or materials storage, shall present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the CO, are not in good repair shall not be allowed on the Post.

1.5.1.3 Equipment

Any item of construction equipment, with the exception of hand tools, which becomes inoperable shall be repaired within five (5) working days or removed from the construction site.

1.5.1.4 Maintenance of Storage Area(s)

It shall be the responsibility of the Contractor to keep all fencing in a state of good repair and proper alignment. Should the Contractor elect to traverse grassed or other areas without paving that are not established roadways, with construction equipment or other vehicles, such grassed or other areas shall be covered with a layer of gravel as necessary to prevent rutting and to prevent the tracking of mud onto paved or established roadways. Gradation of the gravel shall be at the discretion of the Contractor. The Contractor shall be responsible for the cutting of grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, buildings, under trailers and in areas not accessible to mowers shall be edged or trimmed neatly. The Contractor shall water existing plants and grass as specified in Section 02935 TURF.

1.6 SECURITY

1.6.1 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment. The Base law enforcement agency will not provide security checks of the temporary field office.

1.7 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site immediately. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area.

Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored. All utility trenches shall be closed within 48 hours and shall be graded and seeded within 5 days.

1.8 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

-- End of Section --

SECTION 01572

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

10/01

1.1 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

1.2 MANAGEMENT

The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations.

1.3 PLAN

A waste management plan shall be submitted within 15 days after contract award and prior to initiating any site preparation work. The plan shall include the following:

- a. Name of individualson the Contractor's staff responsible for waste prevention and management.
- b. Actions that will be taken to reduce solid waste generation.
- c. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.
- d. Characterization, including estimated types and quantities, of the waste to be generated.
- e. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.

f. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.

g. List of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.

h. Identification of materials that cannot be recycled/reused with an explanation or justification.

i. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

1.4 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered to the Contracting Officer upon completion of the construction.

1.5 COLLECTION

The necessary containers, bins and storage areas to facilitate effective waste management shall be provided and shall be clearly and appropriately identified. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials and separated by one of the following methods:

1.5.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing.

1.5.2 Co-Mingled Method.

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

1.5.3 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.6 DISPOSAL

Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

1.6.1 Reuse.

First consideration shall be given to salvage for reuse since little or no

re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

1.6.2 Recycle.

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible.

1.6.3 Waste.

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

-- End of Section --

SECTION 01670

RECYCLED / RECOVERED MATERIALS

12/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247

Comprehensive Procurement Guideline for
Products Containing Recovered Materials

1.2 OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. EPA designated products specified in this contract comply with the stated policy and with the EPA guidelines. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Various sections of the specifications contain requirements for materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

1.4 EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

1.5 EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be used by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

-- End of Section --

SECTION 01780

CLOSEOUT SUBMITTALS

05/00

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

As-Built Drawings; G.

Drawings showing final as-built conditions of the project. The final CADD as-built drawings shall consist of one set of electronic CADD drawing files in the specified format, one set of mylar drawings, 2 sets of blue-line prints of the mylars, and one set of the approved working as-built drawings.

As-Built Record of Equipment and Materials

Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

Final Approved Shop Drawings; G

Two copies of the final approved as-built shop drawings as described below.

Construction Contract Specifications

Two copies of the as-built specifications as described below.

Real Property Equipment;

Three copies of the draft and three copies of the final "Equipment in Place List" as described below.

Warranty Management Plan; G.

Three sets of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

Warranty Tags

Two record copies of the warranty tags showing the layout and design.

Final Clean-Up

Two copies of the listing of completed final clean-up items.

1.2 PROJECT RECORD DOCUMENTS

1.2.1 As-Built Drawings

This paragraph covers as-built drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

1.2.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file as-built drawings. Coordinate CADD files with GeoBase (GIS) base requirements.

1.2.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and at least one set shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes.

Final as-built drawings shall be prepared after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final as-built drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. The schedule of values shall include a line item for as-builts to be billed for on a monthly basis. Payment will be based on maintaining as-builts on a current monthly basis and final submission of approved as-built drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. The working and final as-built drawings shall show, but shall not be limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.

b. The location and dimensions of any changes within the building structure.

c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract

plans.

d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

e. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

f. Changes or modifications which result from the final inspection.

g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.

h. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, the Contractor shall furnish a contour map of the final borrow pit/spoil area elevations.

i. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

j. Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.

(1) Directions in the modification for posting descriptive changes shall be as follows.

(2) A Modification Circle shall be placed at the location of each deletion. Modification Circle is a circle with the identification of the modification number in the center.

(3) For new details or sections which are added to a drawing, a Modification Circle shall be placed by the detail or section title.

(4) For minor changes, a Modification Circle shall be placed by each area changed on the drawing (each location).

(5) For major changes to a drawing, a Modification Circle shall be placed by the title of the affected plan, section, or detail at each location.

(6) For changes to schedules or drawings, a Modification Circle shall be placed either by the schedule heading or by the change in the schedule.

(7) The Modification Circle size shall be 1/2 inch diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

k. Final As-Built Drawings. When the as-built drawings are completed, and prior to submission to the Government, the contractor shall indicate on each drawing, in the lower right hand corner, in bold letters at least 1/4" high, "AS-BUILT DRAWING".

1.2.1.3 Drawing Preparation

The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

1.2.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only personnel proficient in the preparation of CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings shall be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD files. The Contractor will be furnished AutoCad Release 2000 and a Windows NT operating system. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make required corrections, changes, additions, and deletions.

a. CADD colors shall follow the color scheme of the original drawing. Layer code for changes shall be as follows:

(1) Deleted Items - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders and moved to a layer named "DELETED ITEMS" and that layer shall be "frozen" from plotting.

(2) Added Items - Added items shall be drawn in colors to match the original drawing but shall be placed on a layer called "ITEMS ADDED BY CHANGE ORDER".

(3) Special Items - Items requiring special information, coordination, or special detailing or detailing notes shall follow the drawing color scheme and be placed on a layer called "SPECIAL REQUIREMENTS".

b. The Contract Drawing files shall be renamed in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction conference. Marked-up changes shall be made only to those renamed files. All changes shall be made on the layer/level as the original item. There shall be no deletions of existing lines; existing lines shall be changed to red and moved to the "DELETED ITEMS" layer.

c. When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of

the Contractor in letters at least 1/4 inch high. All other contract drawings shall be marked either "AS-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in the revision block.

d. Within 20 days after Government approval of all of the working as-built drawings for a phase of work, the Contractor shall prepare the final CADD as-built drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days the Contractor shall revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 20 days of substantial completion of all phases of work, the Contractor shall submit the final as-built drawing package for the entire project. The submittal shall consist of one set of electronic files on compact disc, (CD-ROM), one set of mylars, two sets of blue-line prints and one set of the approved working as-built drawings. They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and marked prints as specified shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

1.2.1.5 Payment

Separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be considered a subsidiary obligation of the Contractor. No partial payment will be made. Full amount will be withheld until satisfactory as-builts are submitted and approved.

1.2.2 As-Built Record of Equipment and Materials

The Contractor shall furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Two sets of final record of equipment and materials shall be submitted 10 days after final inspection. The designations shall be keyed to the related area depicted on the contract drawings. The record shall list the following data: Note: Records will be submitted on a unit by unit basis when units are turned over to the Owner.

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number, Company Telephone Number	Composition and Size	Where Used
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1.2.3 Final Approved Shop Drawings

The Contractor shall furnish final approved project shop drawings 30 days after transfer of the completed facility.

1.2.4 Construction Contract Specifications

The Contractor shall furnish final as-built construction contract specifications, including modifications thereto, 30 days after transfer of the completed facility.

1.2.5 Real Property Equipment

The Contractor shall furnish a list of installed equipment furnished under this contract. The list shall include all information usually listed on manufacturer's name plate. The "EQUIPMENT-IN-PLACE LIST" shall include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. A draft list shall be furnished at time of transfer. The final list shall be furnished 30 days after transfer of the completed facility.

1.2.6 Recording Construction Data

- a. During the progress of the work, the Contractor shall keep a careful record at the job site of all changes, corrections, and deviations from the layouts and details shown on the drawings to include all contract modifications. The Contractor shall enter such changes on project drawings promptly, but not later than on a weekly basis.
- b. Where underground utilities are installed, note the elevation of the utility installed every 30 feet. Where new utilities cross existing utilities, note the elevation of the new and existing utility and the vertical and/or horizontal separation. Where new utilities run parallel to new and existing utilities, note the elevation at which installed and the horizontal and/or vertical separation between utilities.

(1) GIS Data: The Contractor shall use conventional surveying and other methods, such as a total station or Global Positioning Systems (GPS) for collection of as-built information at an accuracy level in accordance with "Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy," published by the Federal Geographic Data Committee (FGDC), dated July 1998. This document can be found at http://www.fgdc.gov/standards/status/sub1_3.html. All Survey data collected shall be provided to the Government in a digital format with an attached Survey Report identifying survey method, equipment list, calibration documentation, survey layout, description of control points, control diagrams, and field survey data. A Survey Control Database (consisting of a survey marker database and a survey traverse database) will be produced for all survey control points established under this contract, and delivered in a .dbf or ASCII comma-delimited format. If GPS is used, the Contractor shall use survey grade GPS, at an accuracy level of +/- 2cm., when appropriate, to collect data to be overlaid onto the installation's orthophotograph and/or base map.

(2) All locational feature data (points, lines, polygons) collected shall be delivered in Arc/Info format along with the original source files. The Geospatial files shall have an external spatial reference file (.prj) attached specifying the parameters of the coordinate system used (as provided by the Government). All topologically correct geospatial data shall overlay on the installations latest orthorectified imagery provided by the Government. All accuracy errors shall be reported to the contract project manager.

(3) Feature Attributes: The Contractor shall identify the classification, type, size, location, ID number, and any other necessary attributes (specified by the Government) for all surveyed, mapped, designed, or proposed features. All symbol libraries, font libraries, text sizes, text formats, and text placements should be prepared in accordance with the SDS where practical. The Contractor shall not develop new libraries without prior written approval from the Government.

(4) All graphic and non-graphic data will be collected in the format defined by the CADD/GIS Technology Center's Spatial Data Standards (SDS) release 2.0 (or the most current version available), except where modified by the Government. This document can be found at <http://tsc.wes.army.mil/products/tssds-tsfs/tssds/projects/sds/>.

(5) The Contractor shall provide metadata files for all locational data produced under this contract. The metadata file shall conform to the Federal Geographic Data Committee's "Content Standard for Digital Geospatial Metadata, Version 2.0" (or latest version) found at <http://www.fgdc.gov/metadata/contstan.html>. The output from metadata generator software shall be the standard format for all metadata files created under this contract. In addition, the metadata data shall be provided in ASCII text format. The digital metadata files shall be provided to the Government along with each product deliverable, unless otherwise approved in writing by the Government.

(6) The Government will provide the Contractor with data and information concerning all necessary and pertinent functions and principal features of the identified project. These items will include:

(a) The installation's latest georeferenced digital planimetric data and/or base map in ESRI Arc/Info format, or best format available, with associated data files.

(b) The installation's latest orthorectified imagery and specified geospatial parameters (coordinate system, datum, projection, distance units).

(c) Any pertinent and necessary prototype or seed files.

(d) A copy of CADD/GIS Technology Center's Spatial Data Standards (SDS) release 1.95 (or latest version) on CD-ROM.

(e) A copy of "Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy," published by the Federal Geographic Data Committee (FGDC) in Adobe Acrobat Reader

(.pdf) format.

(f) Frequency settings for the Real-Time Kinematic (RTK) GPS Base Station and the preferred GPS receiver specifications.

(g) Any other data or schematics deemed necessary for project completion, pending approval from the Government.

- c. At the time of beneficial occupancy, the Contractor shall submit as-built data to the Contracting Officer, or his/her designated representative incorporating the aforementioned information into the project drawings. The Contractor shall also ensure a copy of all as-built data is delivered to the Base GeoBase office. The as-built deliverable (plans, shop drawings, surveys, studies, imagery, designs, manuals, spare parts lists, etc.) shall be in a digital (electronic information) format and shall be delivered on standard compact disks (minimum 650 megabytes) in a format that is directly compatible with the CADD/GIS Technology Center's Spatial Data Standards version 2.0 (or latest version available). No "red-line" or marked-up drawings will be accepted.

1.3 WARRANTY MANAGEMENT

1.3.1 Warranty Management Plan

The Contractor shall develop a warranty management plan which shall contain information relevant to the clause Warranty of Construction in Section 00700. At least 30 days before the planned pre-warranty conference, the Contractor shall submit the warranty management plan for Government approval. The warranty management plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase shall be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Information contained in the warranty management plan shall include, but shall not be limited to, the following:

a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

c. A list for each warranted equipment, item, feature of construction or system indicating:

1. Name of item.
2. Model and serial numbers.
3. Location where installed.
4. Name and phone numbers of manufacturers or suppliers.
5. Names, addresses and telephone numbers of sources of spare parts.
6. Warranties and terms of warranty. This shall include one-year overall warranty of construction. Items which have extended warranties shall be indicated with separate warranty expiration dates.
7. Cross-reference to warranty certificates as applicable.
8. Starting point and duration of warranty period.
9. Summary of maintenance procedures required to continue the warranty in force.
10. Cross-reference to specific pertinent Operation and Maintenance manuals.
11. Organization, names and phone numbers of persons to call for warranty service.
12. Typical response time and repair time expected for various warranted equipment.

d. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

e. Procedure and status of tagging of all equipment covered by extended warranties.

f. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.3.2 Performance Bond

The Contractor's Performance Bond shall remain effective throughout the construction and warranty period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.3.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section.

Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor shall furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, shall be continuously available, and shall be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.3.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframes specified, the Government will perform the work and backcharge the construction warranty payment item established.

a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows:

Code 2-Air Conditioning Systems

- (1) Recreational support.
- (2) Air conditioning leak in part of building, if causing damage.
- (3) Air conditioning system not cooling properly.

Code 1-Doors

- (1) Overhead doors not operational, causing a security, fire, or safety problem.
- (2) Interior, exterior personnel doors or hardware, not functioning properly, causing a security, fire, or safety problem.

Code 3-Doors

- (1) Overhead doors not operational.
- (2) Interior/exterior personnel doors or hardware not functioning properly.

Code 1-Electrical

- (1) Power failure (entire area or any building operational after

- 1600 hours).
- (2) Security lights
- (3) Smoke detectors

Code 2-Electrical

- (1) Power failure (no power to a room or part of building).
- (2) Receptacle and lights (in a room or part of building).

Code 3-Electrical

Street lights.

Code 1-Gas

- (1) Leaks and breaks.
- (2) No gas to family housing unit or cantonment area.

Code 1-Heat

- (1). Area power failure affecting heat.
- (2). Heating system partial or total failure.

Code 2-Kitchen Equipment

- (1) Dishwasher not operating properly.
- (2) All other equipment hampering preparation of a meal.

Code 1-Plumbing

- (1) Hot water heater failure.
- (2) Leaking water supply pipes.

Code 2-Plumbing

- (1) Flush valves not operating properly.
- (2) Fixture drain, supply line to commode, or any water pipe leaking.
- (3) Commode leaking at base.

Code 3 -Plumbing

Leaky faucets.

Code 3-Interior

- (1) Floors damaged.
- (2) Paint chipping or peeling.
- (3) Casework.

Code 1-Roof Leaks

Temporary repairs will be made where major damage to property is occurring.

Code 2-Roof Leaks

Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 2-Water (Exterior)

No water to facility.

Code 2-Water (Hot)

No hot water in portion of building listed.

Code 3-All other work not listed above.

1.3.5 Warranty Tags

At the time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by the Contracting Officer. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and the QC signature shall remain blank until project is accepted for beneficial occupancy. The tag shall show the following information.

- a. Type of product/material_____.
- b. Model number_____.
- c. Serial number_____.
- d. Contract number_____.
- e. Warranty period_____from_____to_____.
- f. Inspector's signature_____.
- g. Construction Contractor_____.
- Address_____.
- Telephone number_____.
- h. Warranty contact_____.
- Address_____.
- Telephone number_____.
- i. Warranty response time priority code_____.

j. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.

1.4 MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Prior to final inspection and transfer of the completed facility; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems shall be submitted to and approved by the Contracting Officer as specified in applicable technical specification sections.

1.5 FINAL CLEANING

The premises shall be left broom clean. Stains, foreign substances, and temporary labels shall be removed from surfaces. Carpet and soft surfaces shall be vacuumed. Equipment and fixtures shall be cleaned to a sanitary condition. Filters of operating equipment shall be replaced. Debris shall be removed from roofs, drainage systems, gutters, and downspouts. Paved areas shall be swept and landscaped areas shall be raked clean. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed. A list of completed clean-up items shall be submitted on the day of final inspection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01781N

OPERATION AND MAINTENANCE DATA

03/98

PART 1 GENERAL

1.1 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data/Manuals which are specifically applicable to this contract and a complete and concise depiction of the provided equipment or product. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01330, "Submittal Procedures."

1.1.1 Quantity

Submit five sets of the supplier/manufacturers' O&M information specified herein for the components, assemblies, subassemblies, attachments, and accessories. The items for which O&M Data/Manuals are required are listed in the technical sections which specifies those particular items.

1.1.2 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.1.3 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." For each product, system, or component piece of equipment requiring submission of O&M Data, submit the Data Package specified in the individual technical section.

1.1.4 Delivery

Submit O&M Data Manuals to the Contracting Officer for review and acceptance; submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

- a. In the event the Contractor fails to deliver O&M Data/Manuals within the time limits set forth above, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data/Manuals are associated.

1.1.5 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

1.2 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.2.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation:

1.2.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.2.1.2 Operator Prestart

Include procedures required to set up and prepare each system for use.

1.2.1.3 Startup, Shutdown, and Postshutdown Procedures

Provide narrative description for each operating procedure including control sequence for each.

1.2.1.4 Normal Operations

Provide narrative description of normal operating procedures. Include control diagrams with data to explain operation and control of systems and specific equipment.

1.2.1.5 Emergency Operations

Include emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.

1.2.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and gage reading recording.

1.2.1.7 Environmental Conditions

Include a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.

1.2.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair.

1.2.2.1 Lubrication Data

Include lubrication data, other than instructions for lubrication in accordance with paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications;

- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities; and
- c. A lubrication schedule showing service interval frequency.

1.2.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.2.3 Corrective Maintenance (Repair)

Include manufacturer's recommendations on procedures and instructions for correcting problems and making repairs.

1.2.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.2.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation numbering.

1.2.3.3 Maintenance and Repair Procedures

Include instructions and list tools required to restore product or equipment to proper condition or operating standards.

1.2.3.4 Removal and Replacement Instructions

Include step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.2.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead time to obtain.

1.2.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including craft requirements by type of craft. Corrective maintenance that requires participation of the equipment manufacturer shall be identified and tabulated separately.

1.2.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.2.6 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies. Parts data may cover more than one model or series of equipment. components, assemblies, subassemblies, attachments, or accessories, such as a master parts catalog, in accordance with the manufacturer's standard commercial practice.

1.2.6.1 Warranty Information

List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

1.2.6.2 Personnel Training Requirements

Provide information available from the manufacturers to use in training designated personnel to operate and maintain the equipment and systems properly.

1.2.6.3 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.2.6.4 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each subcontractor installing the product or equipment. Include local representatives and service organizations most convenient to the project site. Provide the name, address, and telephone number of the product or equipment manufacturers.

1.3 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M Data Packages specified in individual technical sections.
The required information for each O&M Data Package is as follows:

1.3.1 Data Package 1

- a. Safety precautions
- b. Maintenance and repair procedures
- c. Warranty information
- d. Contractor information

1.3.2 Data Package 2

- a. Safety precautions
- b. Normal operations
- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan and schedule
- f. Maintenance and repair procedures
- g. Removal and replacement instructions
- h. Spare parts and supply list
- i. Parts identification
- j. Warranty information
- k. Contractor information

1.3.3 Data Package 3

- a. Safety precautions
- b. Normal operations
- c. Emergency operations
- d. Environmental conditions
- e. Lubrication data
- f. Preventive maintenance plan and schedule
- g. Troubleshooting guides and diagnostic techniques
- h. Wiring diagrams and control diagrams
- i. Maintenance and repair procedures
- j. Removal and replacement instructions

- k. Spare parts and supply list
- l. Parts identification
- m. Warranty information
- n. Testing equipment and special tool information
- o. Contractor information

1.3.4 Data Package 4

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and postshutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Operator service requirements
- g. Environmental conditions
- h. Lubrication data
- i. Preventive maintenance plan and schedule
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- l. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Corrective maintenance man-hours
- p. Parts identification
- q. Warranty information
- r. Personnel training requirements
- s. Testing equipment and special tool information
- t. Contractor information

1.3.5 Data Package 5

- a. Safety precautions
- b. Operator prestart

- c. Start-up, shutdown, and post shutdown procedures
- d. Normal operations
- e. Environmental conditions
- f. Preventive maintenance plan and schedule
- g. Troubleshooting guides and diagnostic techniques
- h. Wiring and control diagrams
- i. Maintenance and repair procedures
- j. Spare parts and supply list
- k. Testing equipments and special tools
- l. Warranty information
- m. Contractor information

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 02210
GRADING
03/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil In-Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures
ASTM D 2487	(1990) Classification of Soils for Engineering Purposes
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock In-Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1984) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 UNIT PRICE

1.2.1 MEASUREMENT

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Materials classified in ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL, CH, ML, and MH are satisfactory as fill for overlot grading and are satisfactory in-situ.

1.3.2 Unsatisfactory Materials

Materials classified in ASTM D 2487 as Pt, OH, and OL are unsatisfactory in-situ and as fill. Unsatisfactory materials also include those materials containing roots and other organic matter, trash, debris, frozen materials, and stones larger than six inches.

1.3.3 Cohesionless and Cohesive Materials

Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

1.3.4 Degree of Compaction

Degree of compaction is a percentage of the maximum density obtained by the appropriate test procedure presented in ASTM D 1557, abbreviated hereinafter as a percent of laboratory maximum density.

1.3.5 Topsoil

Material obtained from off-site areas, suitable for topsoils, is defined in Section 02935 TURF. Testing of all material intended for use as topsoil shall be in accordance with Section 02935.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports.

Soils Tests.

Copies of all laboratory and field test reports shall be submitted to the Contracting Officer within 72 hours of the completion of the test. Required soils tests for fill, backfill, and subgrade materials shall be submitted prior to beginning fill and backfill operations. The testing laboratory shall submit an information copy of all field test reports to the office of the Contracting Officer before leaving the construction site.

1.5 SUBSURFACE DATA

Subsurface soil boring logs are attached to Section 01055 SOIL BORING DATA.

These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 DRAINAGE AND DEWATERING

3.2 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes, and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and

affecting operations at the site shall be continually and effectively drained.

3.3 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously below the working level as required to continue construction.

3.4 STRIPPING OF TOPSOIL

Topsoil shall be removed to full depth and shall be stored separate from other excavated materials and piled free of roots, stones, and other undesirable materials. Any surplus of topsoil from excavations and grading shall be removed off Government property.

3.5 EXCAVATION

After topsoil removal has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Satisfactory excavation material shall be stockpiled or shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material, including any soil which is disturbed by the Contractor's operations or softened due to exposure to the elements and water, and surplus material shall be removed from Government property. In the event that it is necessary to remove unsatisfactory material to a depth greater than specified, the Contracting Officer shall be notified and an adjustment in the contract price will be considered in accordance with the CHANGES clause. Excavations carried below the depths indicated, without specific directions, or as required due to the action or inaction of the Contractor during performance of the work, shall, except as otherwise specified, be refilled at the Contractor's expense to the proper grade with satisfactory material as directed. Material required for fills in excess of that produced by excavation within the grading limits shall be obtained from borrow areas.

3.6 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

3.7 BLASTING

Blasting will not be permitted.

3.8 DITCHES AND SWALES

Ditches and swales shall be cut accurately to the cross sections and grades indicated. All roots, stumps, and foreign matter in the sides and bottom of ditches and swales shall be trimmed and dressed or removed to conform to

the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and swales below the grades indicated. Excessive ditch and swale excavation shall be backfilled to grade with satisfactory, thoroughly compacted material. All ditches and swales excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and swales shall be placed in fill areas. Unsatisfactory and excess excavated material shall be disposed of in accordance with directions in paragraph EXCAVATION. No excavated material shall be deposited closer to the edges of the ditches than indicated and in no case less than 3 feet.

3.9 BORROW MATERIAL

Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Borrow materials shall be subject to approval.

3.9.1 Selection

Borrow materials shall be obtained from sources outside the limits of Government-controlled land. The source of borrow material shall be the Contractor's responsibility. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, shall pay all royalties and other charges involved, and shall bear all the expense of developing the sources, including rights-of-way for hauling.

3.10 BACKFILL ADJACENT TO STRUCTURES

Backfill adjacent to structures shall be placed and compacted uniformly in such manner as to prevent wedging action or eccentric loading upon or against the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to prevent sliding of the fill. During backfilling operations and in the formation of embankments, equipment that will overload the structure in passing over and compacting these fills shall not be used. Backfill for storm drains and subdrains, including the bedding and backfill for structures other than culverts and drains, shall conform to the additional requirements in other applicable sections.

3.11 PREPARATION OF GROUND SURFACE FOR FILL

All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsatisfactory material within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill is started. In no case shall unsatisfactory material remain in or under the fill area. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped, or broken up, as directed, in such manner that the fill material will bond with the existing surface. Prepared surfaces on which compacted fill is to be placed shall be wetted or dried as may be required to obtain the specified compaction. Drying shall include disking, harrowing, mixing, and other methods as may be necessary to achieve the proper moisture content.

3.12 FILLS AND EMBANKMENTS

Fills and embankments shall be constructed at the locations and to lines and grades indicated. The completed fill shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case. Satisfactory material obtained during excavation may be used in

forming required fill. Fill shall be satisfactory material and shall be reasonably free from roots, other organic material, and trash and from stones having a maximum diameter greater than 6 inches. No frozen material will be permitted in the fill. Stones having a dimension greater than 3 inches shall not be permitted in the upper 6 inches of fill or embankment. The material shall be placed in successive horizontal layers of 8 inches in loose depth for the full width of the cross section and shall be compacted as specified. Each layer shall be compacted before the overlaying lift is placed. Moisture content of the fill or backfill material shall be adjusted by wetting or aerating, as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

3.13 COMPACTION

Except for paved areas, each layer of the fill or embankment shall be compacted to at least 85 and 90 percent of laboratory maximum density for cohesive and cohesionless materials, respectively. In areas to be paved and other areas indicated as requiring compaction suitable for paved areas, the upper 12" of subgrade shall be compacted to at least 90 and 95% of laboratory maximum density for cohesive and cohesionless material, respectively.

3.14 FINISHED EXCAVATION, FILLS, AND EMBANKMENTS

All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth-graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations, except as otherwise specified. Ditches and swales shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turving materials. For subgrade areas to be paved, the following shall be accomplished as required: (a) soft or otherwise unsatisfactory material shall be replaced with satisfactory excavated material or other approved materials; (b) low areas resulting from removal of unsatisfactory material shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and shall be compacted as specified. The surface of embankments or excavated areas for road construction or other areas on which a base course or pavement is to be placed shall vary not more than 0.05 foot from the established grade and approved cross section. Surfaces other than those that are to be paved shall be finished not more than 0.15 foot above or below the established grade or approved cross section.

3.15 PLACING TOPSOIL

Areas outside the building lines from which topsoil has been removed and areas indicated shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. The subgrade shall be pulverized to a depth of 2 inches by disking or plowing for the bonding of topsoil with the subsoil. Topsoil shall then be uniformly spread, graded, and compacted as specified in Section 02921N TURF. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from off Government property.

3.16 SOILS TESTS

Testing shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory. Laboratory tests for moisture - density relations complete with zero air voids curve, gradation, and Atterberg limits shall be made in accordance with the procedures referenced in ASTM D 1557, ASTM D 422, and ASTM D 4318. Field tests for density and moisture content shall be made in accordance with ASTM D 1556 and ASTM D 2216 except that Method ASTM D 2922 may be used to supplement tests by Method ASTM D 1556. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. When soil conditions exist, which produce inconsistent results by the nuclear gauge method D 2922, only method D 1556 shall be used. Where results by Method D 2922 differ from those by Method D 1556, the results by Method D 1556 shall govern for contract compliance.

The following tests are required:

- a. A minimum of one moisture-density test shall be performed for each classification of fill material, backfill material, and existing subgrade material.
- b. One Atterberg limits test and one gradation analysis is required for every six field density tests.
- c. A minimum of one sand cone density test is required for every six nuclear gauge field density tests or fraction thereof. Worksheets of sand density and sand cone calibration shall be submitted to the Contracting Officer prior to commencing work and each time a new supply of sand is used.
- d. A quart jar sample of each moisture-density test material shall be delivered to the Contracting Officer at the time the test is obtained.
- e. A pint jar sample of each field density test material shall be delivered to the Contracting Officer at the time the test is obtained.
- f. Field density tests shall be performed as follows: a minimum of one test per lift per 500 square feet or fraction thereof is required for fill material and a minimum of one test per lift per 500 square yards or fraction thereof is required for ground surfaces prior to filling. Locations of all tests shall be at the direction of the Contracting Officer.

3.17 PROTECTION

Newly graded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with the environmental protection requirements of the contract.

-- End of Section --

SECTION 02220A

DEMOLITION
05/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1

(1996) U.S. Army Corps of Engineers Safety
and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible (in accordance with Section 01572 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT, if applicable); salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

1.5 PROTECTION

1.5.1 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.5.2 Protection of Structures

Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.3 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.4 Protection From the Weather

The interior of buildings to remain; salvageable materials and equipment shall be protected from the weather at all times.

1.5.5 Protection of Trees

Trees within the project site which might be damaged during demolition, and which are indicated to be left in place, shall be protected by a 6 foot high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the

Contracting Officer.

1.5.6 Environmental Protection

The work shall comply with the requirements of Section 01355 ENVIRONMENTAL PROTECTION.

1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.7 USE OF EXPLOSIVES

Use of explosives will be permitted.

1.8 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available in accordance with the project phasing as specified in Section 01005 PROJECT WORK REQUIREMENTS AND RESTRICTIONS:

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 UTILITIES

Existing utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

3.2 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished, except Government salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.2.1 Salvageable Items and Material

Contractor shall salvage items and material to the maximum extent possible.

3.2.1.1 Material Salvaged for the Contractor

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

3.2.1.2 Items Salvaged for the Government

Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents. The following items reserved as property of the Government shall be delivered to the areas designated: Not to exceed 10 miles.

3.2.1.3 Historical Items

Historical items shall be removed in a manner to prevent damage. The following historical items shall be delivered to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.

3.2.2 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in the disposal area located off the site.

3.3 CLEAN UP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

3.4 PAVEMENTS

Existing pavements designated for removal shall be saw cut and removed in accordance with the details shown on the drawings.

-- End of Section --

SECTION 02226

REMOVAL AND SALVAGE OF HISTORIC BUILDING MATERIALS
11/97

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The work includes removal and salvage and reuse of identified historic items and materials, and removal of resulting rubbish and debris. General demolition of non-historic materials and removal of resulting rubbish and debris shall comply with the requirements of Section 02220A DEMOLITION. Materials to be salvaged or recycled shall be stored daily in areas and manner specified by the Contracting Officer. In the interest of conservation, salvage and recycling shall be pursued to the maximum extent possible.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G.

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged or recycled, dust control, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

1.3 QUALIFICATIONS

The Contractor shall provide qualified workers trained and experienced in whole-building recycling, including removal and salvage of historic materials and shall submit documentation of five consecutive years of work of this type. A list of similar projects shall be provided identifying when, where, and for whom the work was done. A current point-of-contact for identified references shall be provided.

1.4 DUST CONTROL

The amount of dust resulting from removal, salvage and demolition operations shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water to control dust will not be permitted when it will result in, or create, damage to existing building materials and hazardous or objectionable conditions such as ice, flooding and pollution.

1.5 PROTECTION

1.5.1 Protection of Existing Historic Property

Before beginning any removal, salvage or demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing historic items that are to remain in place, to be reused, or to remain the property of the Government. Items damaged by the Contractor shall be repaired and restored to original condition, or replaced, as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing and supports, as required. The Contractor shall ensure that structural elements are not overloaded and shall provide additional supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.2 Protection From the Weather

The interior of buildings to remain and salvageable materials shall be protected from the weather at all times. Salvaged historic materials shall be stored out of contact with the ground and under weathertight covering.

1.5.3 Environmental Protection

The work shall comply with the requirements of Section 13281 ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS and Section 13283 REMOVAL AND DISPOSAL OF LEAD-CONTAINING PAINT.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 SALVAGED ITEMS

Contractor shall salvage items to the maximum extent possible. Prior to any demolition work, historic items to be salvaged shall be removed from the structure. Removal of salvageable items shall be accomplished by hand labor to the maximum extent possible. Care shall be taken to not damage historic portions of the structure to remain or items identified for salvage. Furnishings, equipment, and materials not scheduled for salvage or recycling shall be removed prior to any salvaging procedures. Contractor shall keep a complete recording of all salvaged materials including the condition of such materials before, and after, salvage operations.

3.1.1 Doors

The main front entrance doors with associated hardware and operating mechanisms shall be removed intact (including glass) and salvaged from all units. Doors will be reconditioned and reinstalled.

3.1.2 Finishes

The following special or historic finishes shall be protected and remain intact: Wood flooring.

3.2 DISPOSITION OF MATERIALS

Title to materials and equipment to be demolished, except Government and using service salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.2.1 Material Salvaged for the Contractor

Material salvaged for the Contractor shall be temporarily stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

3.2.2 Items Salvaged for the Government

Salvaged items (as indicated on the drawings) to remain the property of the Government shall be removed in a manner to prevent damage and as directed by the Contracting Officer, shall be packed or crated to protect the items from damage. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents. The items reserved as property of the Government shall be delivered to the areas designated within 4 miles of the construction site.

3.3 EXISTING WOOD FLOOR TO REMAIN

The existing wood flooring, including the stairs, to remain shall be protected from damage during the entire period of construction. Protective measures may include a layer of building felt followed by a layer of hardboard, plywood, or particleboard or other means of protection as approved by the Contracting Officer. Damage to existing floor (even minimal damage) is not permitted. All existing flooring which is damaged (even minimal damage) shall be removed and replaced with new flooring. New flooring shall be similar to existing flooring in all aspects. All such repairs shall be at no additional cost to the Government. At the beginning of construction, a joint inspection of the existing flooring shall be conducted by the Contracting Officer and the Contractor to determine, verify, and confirm the existing condition of the flooring.

3.4 REMOVAL OF SLATE SHINGLES ON SOQ'S

The slate roofing shingles shall be removed from the SOQ as indicated. The Contractor shall use extreme care in the removal process to assure that the existing shingles to remain are not damaged in any way. All existing slate shingles to remain which are damaged in the removal process shall be replaced with new shingles as specified in Section 07310 SLATE SHINGLE ROOFING. At the beginning of construction, a joint inspection of the existing slate shingles shall be conducted by the Contracting Officer and the Contractor to determine, verify, and confirm the condition of the existing shingles. **Comply with additional requirements for slate removal in Section 07310 SLATE SHINGLE ROOFING.**

3.5 CLEAN-UP

Upon completion of the work, portions of structure to remain and adjacent areas and structures shall be cleaned of dust, dirt, and debris caused by salvage and demolition operations. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

-- End of Section --

SECTION 02300A

EARTHWORK
12/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

- | | |
|--------------|--|
| AASHTO T 180 | (1997) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop |
| AASHTO T 224 | (1996) Correction for Coarse Particles in the Soil Compaction Test |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------|--|
| ASTM C 136 | (1996a) Sieve Analysis of Fine and Coarse Aggregates |
| ASTM D 422 | (1963; R 1998) Particle-Size Analysis of Soils |
| ASTM D 1140 | (1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve |
| ASTM D 1556 | (1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method |
| ASTM D 1557 | (1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.)) |
| ASTM D 2487 | (1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System) |
| ASTM D 2922 | (1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) |
| ASTM D 2937 | (1994) Density of Soil in Place by the Drive-Cylinder Method |
| ASTM D 4318 | (1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils |

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SC, CL, ML. Satisfactory materials for grading shall be comprised of stones less than 3 inches.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.2.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density. Since ASTM D 1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve shall be expressed as a percentage of the maximum density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224. To maintain the same percentage of coarse material, the "remove and replace" procedure as described in the NOTE 8 in Paragraph 7.2 of AASHTO T 180 shall be used.

1.2.5 Topsoil

Material suitable for topsoils obtained from offsite areas is defined in Section 02921N TURF..

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Testing

Within 24 hours of conclusion of physical tests, three copies of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Testing

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

1.4 SUBSURFACE DATA

The subsoil investigation report and samples of materials taken from subsurface investigations may be examined at the base civil engineering office.

1.5 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.6 BLASTING

Blasting will not be permitted.

1.7 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of off Government property. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to full depth. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site.

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Surplus satisfactory excavated material not required for fill shall be disposed of off

Government property. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill in excess of that produced by excavation within the grading limits shall be provided by the Contractor from sources off Government property and shall be approved by the Contracting Officer.

3.2.1 Ditches

Excavation of ditches shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches shall not be excavated below grades shown. Excessive open ditch shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed. Where pile foundations are to be used, the excavation of each pit shall be stopped at an elevation 1 foot above the base of the footing, as specified, before piles are driven. After the pile driving has been completed, loose and displaced material shall be removed and excavation completed, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill for which it is to be used. Borrow material shall be obtained from approved private sources.

3.4 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in fills and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

3.5 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND

SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and Section 02630 STORM-DRAINAGE SYSTEM; and Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.6 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

3.6.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 6; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.6.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and recompacted to the specified criteria before additional material is placed.

The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

3.7 EMBANKMENTS

3.7.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 6 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall

be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.8 SUBGRADE PREPARATION

3.8.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Low areas resulting from removal of unsatisfactory material shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

3.8.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas, each layer of the embankment shall be compacted to at least 90 percent of laboratory maximum density.

3.8.2.1 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 95 percentage laboratory maximum density for the depth below the surface of the pavement shown. When more than one soil classification is present in the subgrade, the top 6 inches of subgrade shall be scarified, windrowed, thoroughly blended, reshaped, and compacted.

3.9 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turving materials.

3.10 PLACING TOPSOIL

Topsoil shall be placed as specified in Section 02921N TURF.

3.11 TESTING

Testing shall be performed by an approved commercial testing laboratory. Field in-place density shall be determined in accordance with ASTM D 1556. ASTM D 2937, Drive Cylinder Method shall be used only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompact to meet specification requirements. Tests on recompact areas shall be performed to determine

conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.11.1 Fill and Backfill Material Gradation

One test per 300 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 422 and ASTM D 1140.

3.11.2 In-Place Densities

- a. One test per 1500 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 1500 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 25 linear feet, or fraction thereof, of each lift of embankment or backfill for roads.

3.11.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

- a. One check test per lift for each 1500 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 1500 square feet, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 25 linear feet, or fraction thereof, of embankment or backfill for roads.

3.11.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.11.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.11.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.12 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, or pavement be placed on a muddy, spongy, or frozen subgrade.

-- End of Section --

SECTION 02315A

EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS
08/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2216	(1998) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.2 DEGREE OF COMPACTION

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, abbreviated as percent laboratory maximum density.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Testing

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SP-SM.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 3 inches in any dimension. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM, GP-GM, GW-GM, SW-SM, SP-SM, and SM shall be identified as cohesionless only when the fines are nonplastic.

2.2 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 1-1/2 inches and no more than 3 percent by weight shall pass the No. 8 size sieve.

PART 3 EXECUTION

3.1 TOPSOIL

Topsoil shall be stripped to full depth below existing grade within the designated excavations and grading lines and deposited in storage piles for later use. Excess topsoil shall be disposed as specified for excess excavated material.

3.2 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure, excavation for all work incidental thereof. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms.

Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be replaced with satisfactory material; and payment will

be made in conformance with the CHANGES clause of the CONTRACT CLAUSES. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced, at no additional cost to the Government, with satisfactory materials to the indicated excavation grade; except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.3 DRAINAGE AND DEWATERING

3.3.1 Drainage

Surface water shall be directed away from excavation and construction sites to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.3.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least one foot below the working level.

3.4 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

3.5 CLASSIFICATION OF EXCAVATION

Excavation will be unclassified regardless of the nature of material encountered.

3.6 BLASTING

Blasting will not be permitted.

3.7 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to

accommodate bells and joints so that pipe will be uniformly supported for the entire length.

3.8 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02300 EARTHWORK.

3.9 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02300 EARTHWORK.

3.10 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. For pile foundations, the excavation shall be stopped at an elevation of from 6 to 12 inches above the bottom of the footing before driving piles. After pile driving has been completed, the remainder of the excavation shall be completed to the elevations shown.

3.11 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.12 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory materials shall be placed in horizontal layers not exceeding 8 inches in loose thickness, or 6 inches when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation

cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below:

	Percent Laboratory maximum density	
	Cohesive material	Cohesionless material
<hr/>		
Fill, embankment, and backfill		
<hr/>		
Under structures, building slabs, steps, paved areas, around footings, and in trenches	90	95
Under sidewalks and grassed areas	85	90
 Subgrade		
<hr/>		
Under building slabs, steps, and paved areas, top 12 inches	90	95
Under sidewalks, top 6 inches	85	90

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before to the required density prior to further construction thereon. Recomposition over underground utilities and heating lines shall be by hand tamping.

3.13 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2216, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to

determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. ASTM D 2937 shall be used only for soft, fine-grained, cohesive soils. The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation. Copies of all laboratory and field test reports shall be submitted to the Contracting Officer within 72 hours of the completion of the test. Required soils tests for fill, backfill, and subgrade materials shall be submitted prior to beginning fill and backfill operations. The testing laboratory shall submit an information copy of all field test reports to the office of the Contracting Officer before leaving the construction site.

3.13.1 In-Place Densities

In-place density and moisture content test results shall be included with the Contractor's daily construction quality control reports.

3.13.1.1 In-Place Density of Subgrades

One test per 500 square foot or fraction thereof.

3.13.1.2 In-Place Density of Fills and Backfills

One test per 500 square foot or fraction thereof of each lift for fill or backfill areas compacted by other than hand or hand-operated machines. The density for each lift of fill or backfill materials for trenches, pits, building perimeters or other structures or areas less than 5 feet in width, which are compacted with hand or hand-operated machines shall be tested as follows: One test per each area less than 500 square feet, or one test for each 100 linear foot of long narrow fills. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows: One check per lift for each 500 linear feet of long narrow fills, and a minimum of one check per lift for other fill and backfill areas.

3.13.2 Moisture Content

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D 2216.

3.13.3 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material, including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

3.14 CAPILLARY WATER BARRIER

Capillary water barrier under concrete floor and area-way slabs on grade shall be placed directly on the subgrade and shall be compacted with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.15 GRADING

Areas within 5 feet outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.16 SPREADING TOPSOIL

Areas outside the building lines from which topsoil has been removed shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. The subgrade shall be pulverized to a depth of 2 inches by disking or plowing for the bonding of topsoil with the subsoil. Topsoil shall then be uniformly spread, graded, and compacted as specified in Section 02921N TURF and left free of surface irregularities.

Topsoil shall be compacted by one pass of a cultipacker, roller, or other approved equipment weighing 100 to 160 pounds per linear foot of roller. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading.

3.17 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades reestablished to the required elevations and slopes.

-- End of Section --

SECTION 02316A

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
05/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.2 DEGREE OF COMPACTION

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Field Density Tests
Testing of Backfill Materials

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SW-SM, SP-SM.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 2 inches in any direction. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

2.1.4 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

2.1.5 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 1 inch sieve. The maximum allowable aggregate size shall be 3 inches, in any dimension or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.1.6 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 3 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 2 inches in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be

encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

2.3 Detection Wire For Non-Metallic Piping

Detection wire shall be insulated single strand, solid copper with a minimum diameter of 12 AWG.

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Earth excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

3.1.1 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 6 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 8 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.1.1.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.1.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.2 Stockpiles

Stockpiles of satisfactory, unsatisfactory, and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The joints and couplings shall be left uncovered during the pressure test.

3.2.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

3.2.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.2.1.3 Bedding and Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit.

The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

3.2.1.4 Final Backfill

The remainder of the trench, except for special materials for roadways, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- a. Roadways, Driveways, and Garage Concrete Ramps: Backfill shall be placed up to the elevation at which the requirements in Section 02300 EARTHWORK control. Water flooding or jetting methods of compaction will not be permitted.
- b. Sidewalks or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.3 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.3.1 Gas Distribution

Trenches shall be excavated to a depth that will provide not less than 18 inches of cover in rock excavation and not less than 24 inches of cover in other excavation. Trenches shall be graded as specified for pipe-laying requirements in Section 02556 GAS DISTRIBUTION SYSTEM.

3.3.2 Water Lines and Force Mains

Trenches shall be of a depth to provide a minimum cover of 2-1/2 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.3.3 Heat Distribution System

Initial backfill material shall be free of stones larger than 1/4 inch in any dimension.

3.3.4 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated. Special trenching requirements for direct-burial electrical cables and conduits are specified in Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.3.5 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Copies of all laboratory and field test reports shall be submitted to the Contracting Officer within 72 hours of the completion of the test. Required soils tests for fill, backfill, and subgrade materials shall be submitted prior to beginning fill and backfill operations. The testing laboratory shall submit an information copy of all field test reports to the office of the Contracting Officer before leaving the construction site.

3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory.

3.4.2 Testing of Backfill Materials

Classification of backfill materials shall be determined in accordance with ASTM D 2487 and the moisture-density relations of soils shall be determined in accordance with ASTM D 1557. A minimum of one soil classification and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 500 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556 and ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

3.4.4 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, the pipe shall be inspected

to determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer. Pipe sizes larger than 36 inches shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgement of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

-- End of Section --

SECTION 02364A

TERMITICIDE TREATMENT MEASURES FOR SUBTERRANEAN TERMITE CONTROL
06/98

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Termiticide Application Plan

Termiticide application plan with proposed sequence of treatment work with dates and times. The termiticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area/volume treated, amount applied; and the name and state license number of the state certified applicator shall be included.

Termiticides

Manufacturer's label and Material Safety Data Sheet (MSDS) for termiticides proposed for use.

Foundation Exterior

Written verification that other site work will not disturb the treatment.

Utilities and Vents

Written verification that utilities, vents have been located.

Crawl and Plenum Air Spaces

Written verification that crawl spaces and plenum air spaces have been located.

Verification of Measurement

Written verification that the volume of termiticide used meets the application rate.

Application Equipment

A listing of equipment to be used.

SD-04 Samples

Termiticides; G

Termiticide samples obtained during application, upon request.

SD-06 Test Reports

Equipment Calibration and Tank Measurement

Certification of calibration tests conducted on the equipment used in the termiticide application.

Soil Moisture

Soil moisture test result.

SD-07 Certificates

Qualifications

Qualifications and state license number of the termiticide applicator.

1.2 QUALIFICATIONS

The Contractor's principal business shall be pest control. The Contractor shall be licensed and the termiticide applicators certified in the state where the work is to be performed. Termiticide applicators shall also be certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control.

1.3 SAFETY REQUIREMENTS

The Contractor shall formulate, treat, and dispose of termiticides and their containers in accordance with label directions. Use the clothing and personal protective equipment specified on the labeling for use during all phases of the application.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Termiticide material shall be delivered to the site in the original unopened containers bearing legible labels indicating the EPA registration number and manufacturer's registered uses. All other materials to be used on site for the purpose of termite control shall be delivered in new or otherwise good condition as supplied by the manufacturer or formulator.

1.4.2 Storage

Materials shall be stored in designated areas and in accordance with manufacturer's labels. Termiticides and related materials shall be kept under lock and key when unattended.

1.4.3 Handling

Termiticides shall be handled in accordance with manufacturer's labels. Manufacturer's warnings and precautions shall be observed. Materials shall be handled preventing contamination by dirt, water, and organic material.

Protect termiticides from sunlight as recommended by the manufacturer.

1.5 INSPECTION

Termiticides shall be inspected upon arrival at the job site for conformity to type and quality in accordance with paragraph TERMITICIDE. Each label shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended. Other materials shall be inspected for conformance with specified requirements. Unacceptable materials shall be removed from the job site.

1.6 WARRANTY

The Contractor shall provide a 5-year written warranty against infestations or reinfestations by subterranean termites of the buildings or building additions constructed under this contract. Warranty shall include annual inspections of the buildings or building additions.

PART 2 PRODUCTS

2.1 TERMITICIDES

Termiticides shall be currently registered by the EPA. Termiticide shall be selected for maximum effectiveness and duration after application. The selected termiticide shall be suitable for the soil and climatic conditions at the project site.

PART 3 EXECUTION

3.1 TECHNICAL REPRESENTATIVE

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for subterranean termites. They may be present during treatment application.

3.2 SITE PREPARATION

Site preparation shall be in accordance with Sections 02300A EARTHWORK, 02221 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS, and 02935 TURF. Work related to final grades, landscape plantings, foundations, or any other alterations to finished construction which might alter the condition of treated soils, shall be coordinated with this specification.

3.2.1 Ground Preparation

Food sources shall be eliminated by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

3.2.2 Verification

Before work starts, the Contractor shall verify that final grades are as indicated and smooth grading has been completed in accordance with Section 02300A EARTHWORK. Soil particles shall be finely graded with particles no larger than 1 inch and compacted to eliminate soil movement to the greatest degree.

3.2.3 Foundation Exterior

The Contractor shall provide written verification that final grading and landscape planting operations will not disturb treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures.

3.2.4 Utilities and Vents

The Contractor shall provide written verification that the location and identity of HVAC ducts and vents, water and sewer lines, and plumbing have been accomplished prior to the termiticide application.

3.2.5 Crawl and Plenum Air Spaces

The Contractor shall provide written verification that the location and identity of crawl and plenum air spaces have been accomplished prior to the termiticide application.

3.3 SITE CONDITIONS

The following conditions shall determine the time of application.

3.3.1 Soil Moisture

Soils to be treated shall be tested immediately before application. Soil moisture content shall be tested to a minimum depth of 3 inches. The soil moisture shall be as recommended by the termiticide manufacturer. The termiticide will not be applied when soil moisture exceeds manufacturer's recommendations because termiticides do not adhere to the soil particles in saturated soils.

3.3.2 Runoff and Wind Drift

Termiticide shall not be applied during or immediately following heavy rains. Applications shall not be performed when conditions may cause runoff or create an environmental hazard. Applications shall not be performed when average wind speed exceeds 10 miles per hour. The termiticide shall not be allowed to enter water systems, aquifers, or endanger humans or animals.

3.3.2.1 Vapor Barriers and Waterproof Membranes

Termiticide shall be applied prior to placement of a vapor barrier or waterproof membrane.

3.3.2.2 Utilities and Vents

Prior to application, HVAC ducts and vents located in treatment area shall be turned off and blocked to protect people and animals from termiticide.

3.3.3 Placement of Concrete

Concrete covering treated soils shall be placed as soon as the termiticide has reached maximum penetration into the soil. Time for maximum penetration shall be as recommended by the manufacturer.

3.4 TERMITICIDE TREATMENT

3.4.1 Equipment Calibration and Tank Measurement

Immediately prior to commencement of termiticide application, calibration tests shall be conducted on the application equipment to be used and the application tank shall be measured to determine the volume and contents. These tests shall confirm that the application equipment is operating within the manufacturer's specifications and will meet the specified requirements. The Contractor shall provide written certification of the equipment calibration test results within 1 week of testing.

3.4.2 Mixing and Application

Formulating, mixing, and application shall be performed in the presence of the Contracting Officer or the technical representative. A closed system is recommended as it prevents the termiticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying termiticides shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.4.3 Treatment Method

For areas to be treated, the Contractor shall establish complete and unbroken vertical and/or horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products.

3.4.3.1 Surface Application

Surface application shall be used for establishing horizontal barriers. Surface applicants shall be applied as a coarse spray and provide uniform distribution over the soil surface. Termiticide shall penetrate a minimum of 1 inch into the soil, or as recommended by the manufacturer.

3.4.3.2 Rodding and Trenching

Rodding and trenching shall be used for establishing vertical soil barriers. Trenching shall be to the depth of the foundation footing. Width of trench shall be as recommended by the manufacturer, or as indicated. Rodding or other approved method may be implemented for saturating the base of the trench with termiticide. Immediately after termiticide has reached maximum penetration as recommended by the manufacturer, backfilling of the trench shall commence. Backfilling shall be in 6 inch rises or layers. Each rise shall be treated with termiticide.

3.4.4 Sampling

The Contracting Officer may draw from stocks at the job site, at any time and without prior notice, samples of the termiticides used to determine if the amount of active ingredient specified on the label is being applied.

3.5 VERIFICATION OF MEASUREMENT

Once termiticide application has been completed, tank contents shall be measured to determine the remaining volume. The total volume measurement of used contents for the application shall equal the established application rate for the project site conditions. The Contractor shall provide written verification of the measurements.

3.6 CLEAN UP, DISPOSAL, AND PROTECTION

Once application has been completed, the Contractor shall proceed with clean up and protection of the site without delay.

3.6.1 Clean Up

The site shall be cleaned of all material associated with the treatment measures, according to label instructions, and as indicated. Excess and waste material shall be removed and disposed off site.

3.6.2 Disposal of Termiticide

The Contractor shall dispose of residual termiticides and containers off Government property, and in accordance with label instructions and EPA criteria.

3.6.3 Protection of Treated Area

Immediately after the application, the area shall be protected from other use by erecting barricades and providing signage as required or directed. Signage shall be placed inside the entrances to crawl spaces and shall identify the space as treated with termiticide and not safe for children and animals.

3.7 CONDITIONS FOR SATISFACTORY TREATMENT

3.7.1 Equipment Calibrations and Measurements

Where results from the equipment calibration and tank measurements tests are unsatisfactory, re-treatment will be required.

3.7.2 Testing

Should an analysis, performed by a third party, indicate that the samples of the applied termiticide contain less than the amount of active ingredient specified on the label, and/or if soils are treated to a depth less than specified or approved, re-treatment will be required.

3.7.3 Disturbance of Treated Soils

Soil and fill material disturbed after treatment shall be re-treated before placement of slabs or other covering structures.

3.7.4 Termites Found Within the Warranty Period

If live subterranean termite infestation or termite damage is discovered during the warranty period, the Contractor shall re-treat the site.

3.8 RE-TREATMENT

Where re-treatment is required, the Contractor shall:

- a. Re-treat the soil and/or perform other treatment as necessary for prevention or elimination of subterranean termite infestation.
- b. Repair damage caused by termite infestation.

-- End of Section --

SECTION 02531A

SANITARY SEWERS

04/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1999a) Concrete Aggregates
ASTM C 94/C 94M	(2000) Ready-Mixed Concrete
ASTM C 150	(1999a) Portland Cement
ASTM C 828	(1998) Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C 924	(1998) Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2680	(1995a) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 3034	(1998) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F 402	(1993; R 1999) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F 794	(1999) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 949	(2000) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings,
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3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids

AWWA C111 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C115 (1999) Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

AWWA C151 (1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 49 (1994) Hazardous Chemicals Data

NFPA 325-1 (1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids

NFPA 704 (1996) Identification of the Fire Hazards of Materials for Emergency Response

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6 (1990) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe

UBPPA UNI-B-9 (1990; Addenda 1994) Recommended Performance Specification for Polyvinyl Chloride (PVC) Profile Wall Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter (Nominal Pipe Sizes 4-48 inch)

1.2 GENERAL REQUIREMENTS

The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the building to which the sewer system is to be connected. The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. Excavation and backfilling is specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished after inspection by the Contracting Officer. Force mains are specified in Section 02532 FORCE MAINS; SEWER. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Portland Cement

Certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes.

Joints

Certificates of compliance stating that the fittings and gaskets are to be used for waste drains.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Plastic Pipe

Polyvinyl chloride (PVC) composite sewer piping shall conform to ASTM D 2680. Size 8 inch through 15 inch diameter.

2.1.1.1 PVC Pipe

ASTM D 3034, Type PSM with a maximum SDR of 35, Size 15 inches or less in diameter. PVC shall be certified by the compounder as meeting the requirements of ASTM D 1784, cell Class 12454B. The pipe stiffness shall be greater than or equal to 735/D for cohesionless material pipe trench backfills.

2.1.2 Ductile Iron Pipe

Pipe shall conform to AWWA C151 unless otherwise shown or specified.

2.2 REQUIREMENTS FOR FITTINGS

Fittings shall be compatible with the pipe supplied and shall have a strength not less than that of the pipe. Fittings shall conform to the respective specifications and other requirements specified below.

2.2.1 Fittings for Plastic Pipe

2.2.1.1 Fittings for PVC Pipe

ASTM D 3034 for type PSM pipe. ASTM F 949 for corrugated sewer pipe with a smooth interior. UBPPA UNI-B-9 and ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior.

2.2.2 Fittings for Ductile Iron Pipe

Mechanical fittings shall conform to AWWA C110, rated for 150 psi.

Push-on fittings shall conform to AWWA C110 and AWWA C111, rated for 150 psi.

2.3 JOINTS

Joints installation shall comply with the manufacturer's instructions. Fittings and gaskets utilized for waste drains or industrial waste lines shall be certified by the manufacturer as oil resistant.

2.3.1 Plastic Pipe Jointing

Flexible plastic pipe (PVC) gasketed joints shall conform to ASTM D 3212.

2.3.2 Ductile Iron Pipe Jointing

Push-on joints shall conform to AWWA C111. Mechanical joints shall conform to AWWA C111 as modified by AWWA C151. Flanged joints shall conform to AWWA C115.

2.4 BRANCH CONNECTIONS

Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved. Saddles for PVC composite pipe shall conform to Figure 2 of ASTM D 2680; and saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

2.5 CEMENT MORTAR

2.5.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type II for concrete used in concrete pipe, concrete pipe fittings, and manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking. Where aggregates are alkali reactive, as determined by Appendix XI of ASTM C 33, a cement containing less than 0.60 percent alkalies shall be used.

2.5.2 Portland Cement Concrete

Portland cement concrete shall conform to ASTM C 94/C 94M, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psi minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Adjacent Facilities

3.1.1.1 Water Lines

Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be closer horizontally than 10 feet to a water-supply main or service line, except that where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of 10 feet on each

side of the crossing shall be fully encased in concrete or shall be acceptable pressure pipe with no joint closer horizontally than 3 feet to the crossing. The thickness of the concrete encasement including that at the pipe joints shall be not less than 4 inches.

3.1.1.2 Roads

Water pipe shall be encased in a sleeve of rigid conduit for the lengths shown. Where sleeves are required, the pipe sleeve shall be as specified for storm drains in Section 02630 STORM-DRAINAGE SYSTEM. A minimum clearance of at least 2 inches between the inner wall of the sleeve and the maximum outside diameter of the sleeved pipe and joints shall be provided. Sand bedding shall be provided for the water pipe through the sleeve. Sleeves of ferrous material shall be provided with the corrosion protection as required for the conditions encountered at the site of installation.

3.1.1.3 Structural Foundations

Where sewer pipe is to be installed within 3 feet of an existing or proposed building or structural foundation such as a retaining wall, or any similar structure, the sewer pipe shall be sleeved as specified above. Contractor shall ensure there is no damage to these structures, and no settlement or movement of foundations or footing.

3.1.2 Pipe Laying

- a. Pipe shall be protected during handling against impact shocks and free fall; the pipe interior shall be free of extraneous material.
- b. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.
- c. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints shall then be placed, fitted, joined, and adjusted to obtain the degree of water tightness required.
- d. Installations of solvent weld joint pipe or PVC pipe and fittings shall be in accordance with ASTM F 402. The Contractor shall ensure adequate trench ventilation and protection for workers installing the pipe.

3.1.2.1 Trenches

Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

3.1.2.2 Backfill

As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade. Plastic pipe shall be completely covered to prevent damage from ultraviolet light.

3.1.2.3 Width of Trench

If the maximum width of the trench at the top of the pipe, as specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, is exceeded for any reason other than by direction, the Contractor shall install, at no additional cost to the Government, concrete cradling, pipe encasement, or other bedding required to support the added load of the backfill.

3.1.2.4 Jointing

Joints between different pipe materials shall be made as specified, using approved jointing materials.

3.1.2.5 Handling and Storage

Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities for plastic pipe, fittings, joint materials and solvents shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

3.1.3 Leakage Tests

Lines shall be tested for leakage by low pressure air testing, infiltration tests or exfiltration tests, as appropriate. Low pressure air testing for PVC pipe shall be as prescribed in UBPPA UNI-B-6. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C 828 and ASTM C 924, after consultation with the pipe manufacturer. Prior to infiltration or exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.

Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. When the Contracting Officer determines that infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 25 gal per inch diameter per mile of pipeline per day. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Government.

3.1.4 Test for Deflection

When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline not less than 30 days after the completion of all work including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 92.5 percent of the inside diameter of the pipe. A tolerance of plus 0.5 percent will be permitted. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 psi or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on the opposite end of the shaft shall produce compression throughout the remote end of the ball, cylinder or circular section. Circular sections shall be spaced so that the distance from the external faces of the front and back sections shall equal or exceed the diameter of the circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through or by being flushed through with water, shall be cause for rejection of that run. When a deflection device is used for the test in lieu of the ball, cylinder, or circular sections described, such device shall be approved prior to use. The device shall be sensitive to 1.0 percent of the diameter of the pipe being measured and shall be accurate to 1.0 percent of the indicated dimension. Installed pipe showing deflections greater than 7.5 percent of the normal diameter of the pipe shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

3.2 CONCRETE CRADLE AND ENCASEMENT

The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

3.3 INSTALLATION OF WYE BRANCHES

Wye branches shall be installed where sewer connections are indicated or where directed. Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

3.4 CONNECTING TO EXISTING MANHOLES

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting,

and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

3.5 BUILDING CONNECTIONS

Building connections shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building, unless otherwise indicated. Where building drain piping is not installed, the Contractor shall terminate the building connections approximately 5 feet from the site of the building at a point and in a manner designated.

3.6 CLEANOUTS AND OTHER APPURTENANCES

Cleanouts and other appurtenances shall be installed where shown on the drawings or as directed by the Contracting Officer, and shall conform to the detail of the drawings.

-- End of Section --

SECTION 02532A

FORCE MAINS; STORM SEWER
07/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2122	(1998) Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D 2241	(1996b) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2657	(1997) Heat Fusion Joining Polyolefin Pipe and Fittings
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 3035	(1995) Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D 3139	(1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3308	(1997) PTFE Resin Skived Tape
ASTM D 3350	(1998a) Polyethylene Plastics Pipe and Fittings Materials
ASTM D 4101	(1999) Propylene Plastic Injection and Extrusion Materials

ASTM F 477 (1999) Elastomeric Seals (Gaskets) for
Joining Plastic Pipe

ASTM F 1483 (1998) Oriented Poly(Vinyl Chloride), PVC0,
Pressure Pipe

ASME INTERNATIONAL (ASME)

ASME B16.1 (1998) Cast Iron Pipe Flanges and Flanged
Fittings

ASME B16.3 (1992) Malleable Iron Threaded Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C111 (1995) Rubber-Gasket Joints for
Ductile-Iron Pressure Pipe and Fittings

AWWA C200 (1997) Steel Water Pipe - 6 In. (150 mm)
and Larger

AWWA C203 (1997) Coal-Tar Protective Coatings and
Linings for Steel Water Pipelines - Enamel
and Tape - Hot-Applied

AWWA C207 (1994) Steel Pipe Flanges for Waterworks
Service - Sizes 4 In. Through 144 In. (100
mm through 3,600 mm)

AWWA C210 (1997) Liquid-Epoxy Coating Systems for the
Interior and Exterior of Steel Water
Pipelines

AWWA C508 (1993; C508a) Swing-Check Valves for
Waterworks Service, 2 In. (50 mm) Through
24 In. (600 mm) NPS

AWWA C600 (1993) Installation of Ductile-Iron Water
Mains and Their Appurtenances

AWWA C909 (1998) Molecularly Oriented Polyvinyl
Chloride (PVC0) Pressure Pipe, 4 IN through
12 IN (100 mm through 300 mm), for Water
Distribution

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Hydrostatic Tests

Copies of test results.

1.3 DELIVERY AND STORAGE

Pipe, fittings and accessories, and pipe coatings shall not be damaged during delivery, handling, and storage.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

Piping for force mains less than 4 inches in diameter shall be galvanized steel, polyvinyl chloride (PVC) plastic, polyethylene (PE) plastic or polypropylene plastic. Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Plastic Pipe

2.1.1.1 PE Pipe

ASTM D 3350 and ASTM D 3035, minimum pressure rating of 100 psi at 73.4 degrees F.

2.1.1.2 Polypropylene Pipe

ASTM D 2122 and ASTM D 4101.

2.1.1.3 PVC Pipe

- a. PVC Pipe and Fittings Less Than 4 inches Diameter: ASTM D 1785, Schedule 80, or ASTM D 2241, SDR 26, with screw joints, push-on joints, or solvent weld joints.

2.1.1.4 Oriented Polyvinyl Chloride (PVC) Plastic Pipe

Pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454-B. Pipe shall conform to AWWA C909, Class 150, and to ASTM F 1483 and shall have an outside diameter equal to cast iron outside diameter.

2.1.2 Steel Pipe

- a. Steel Pipe Less Than 6 inches Diameter: ASTM A 53, standard weight, threaded end, galvanized.
- b. Fittings Less Than 6 inches Diameter: ASME B16.3, galvanized.

2.2 JOINTS

2.2.1 PE Piping

- a. Heat Fusion Joints: ASTM D 2657.
- b. Flanged Joints: ASME B16.1 or AWWA C207.
- c. Mechanical Joints: ASME B16.1.

2.2.2 Polypropylene Piping

Heat Fusion Joints: ASTM D 2657.

2.2.3 PVC Piping

- a. Screw Joint Fittings: ASTM D 2464, Schedule 80.
- b. Push-On Joint Fittings: ASTM D 3139, with ASTM F 477gaskets.
- c. Solvent Cement: ASTM D 2564.
- d. Couplings for use with plain end pipe shall have centering rings or stops to ensure the coupling is centered on the joint.

2.2.4 PVC Pipe

Joints shall conform to ASTM D 3139. Elastomeric gaskets shall conform to ASTM F 477.

2.2.5 Steel Piping

- a. Push-on Joints: AWWA C200.
- b. Mechanical Joints: AWWA C200.
- c. Flanged Joints: AWWA C207.

2.3 VALVES

2.3.1 Gate Valves

Valves for buried service shall be non-rising stem (NRS), 2 inch square nut operated with joints applicable to the pipe or installation. Buried valves shall be furnished with extension stems comprising socket, extension stem and operating nut, and shall be of an appropriate length to bring operating nut to within 6 inches of grade. One 4 foot "T" handle valve wrench shall be furnished for each quantity of 6 buried valves. Gate valves that are exposed or installed inside shall be outside screw and yoke (OS&Y), handwheel operated with flange ends unless otherwise indicated. Gate valve operating nuts and handwheels shall have an arrow and the word "OPEN" cast in raised letters to indicate the direction of opening. Gate valves 14 inches and larger shall be equipped with gearing to reduce operating effort.

2.3.2 Check Valves

Check valves shall permit free flow of storm water forward and provide a positive check against backflow. Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. The body shall be iron. The manufacturer's name, initials, or trademark and also the size of the valve, working pressure, and direction of flow shall be directly cast on the body.

- a. Ball Check Valves shall be iron body, shall have flanged ends, and shall be the non-slam type. Flanges shall be the 125 pound type complying with ASME B16.1. Ball shall be stainless steel unless otherwise specified.
- b. Swing Check Valves shall comply with AWWA C508 and shall be iron body, bronze mounted, and shall have flanged ends. Flanges shall be the 125 pound type complying with ASME B16.1.

2.4 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subject to vehicular traffic. Cast iron boxes shall be the extension type with slide type adjustment and with flared base. The minimum thickness of metal shall be 3/16 inch. The box length shall be adaptable, without full extension, to the depth of cover over the pipe at the valve locations. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "SEWER" shall be cast in the cover.

2.5 MISCELLANEOUS MATERIALS

Miscellaneous materials shall comply with the following requirements:

2.5.1 Pipe Coatings and Linings

- a. Steel, interior: AWWA C203 or AWWA C210.
- b. Steel, exterior, buried: AWWA C203.
- c. Steel, exterior, exposed: AWWA C210.

2.5.2 Joint Lubricants

Joint lubricants shall be as recommended by the pipe manufacturer.

2.5.3 Bolts, Nuts and Glands

AWWA C111.

2.5.4 Joint Compound

A stiff mixture of graphite and oil or inert filler and oil.

2.5.5 Joint Tape

ASTM D 3308.

2.5.6 Bond Wire

Bond wire type RHW or USE, Size 1/0 AWG, neoprene jacketed copper conductor shaped to stand clear of the joint.

PART 3 EXECUTION

3.1 INSTALLATION

Pipe, pipe fittings, and appurtenances shall be installed at the locations indicated. Excavation, trenching, and backfilling shall be as specified in Section 02316A EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.1 Adjacent Facilities

Installation of force mains near adjacent facilities shall be as specified in Section 02531 SANITARY SEWERS.

3.1.2 Cutting

Pipe shall be cut in a neat manner with mechanical cutters. Wheel cutters shall be used where practicable. Sharp and rough edges shall be ground smooth and loose material removed from the pipe before laying.

3.1.3 Laying

Except where otherwise authorized, pipe shall be laid with bells facing the direction of laying. Before lowering and while suspended, the pipe shall be inspected for defects. Defective material shall be rejected. Pipe shall be laid in compliance with the following:

- a. Steel: AWWA C600.
- b. Polyvinyl Chloride: Manufacturer's instructions.
- c. Polyethylene: ASTM D 2774.
- d. Polypropylene: ASTM D 2774.

3.1.4 Jointing

3.1.4.1 Joints for PE Pipe

Heat fusion joints shall comply with the manufacturer's instructions concerning equipment, temperature, melt time, heat coat, and joining time. Flanged and mechanical joints shall be made in compliance with the manufacturer's instructions.

3.1.4.2 Joints for Polypropylene Pipe

Heat fusion joints shall comply with the manufacturer's instructions concerning equipment, temperature, melt time, heat coat, and joining time.

3.1.4.3 Joints for PVC Pipe

- a. Threaded joints shall be made by wrapping the male threads with joint tape or by applying an approved thread lubricant, then threading the joining members together. The joint shall be tightened with strap wrenches which will not damage the pipe and fittings. The joint shall be tightened no more than 2 threads past hand-tight.
- b. Push-on joints: The ends of pipe for push-on joints shall be beveled to facilitate assembly. Pipe shall be marked to indicate when the pipe is fully seated. The gasket shall be lubricated to prevent displacement. The gasket shall remain in proper position in the bell or coupling while the joint is made.
- c. Solvent-weld joints shall comply with the manufacturer's instructions.

3.1.4.4 Joints for Steel Pipe

Screw joints shall be made tight with joint tape or joint compound applied with a brush to the male threads only. Installation of mechanical joints, push-on joints, and flanged joints shall comply with the manufacturer's instructions.

3.1.5 Coating and Lining

Field coating of non-galvanized steel pipe shall comply with AWWA C203. The applied materials shall be tested by means of a spark-type electrical device in compliance with AWWA C203. Flaws and holidays in the coating or lining of the pipe and the pipe joints shall be repaired; the repaired areas shall be at least equal in thickness to the minimum required for the pipe.

3.1.6 Installation of Valves

Prior to installation, valves shall be cleaned of all foreign matter and inspected for damage. Valves shall be fully opened and closed to ensure that all parts are properly operating. Valves shall be installed with the stem in the vertical position.

3.1.7 Installation of Valve Boxes

Valve boxes shall be installed over each outside gate valve, unless otherwise indicated. Valve boxes shall be centered over the valve. Fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides or to undisturbed trench face, if less than 4 feet.

3.1.8 Bonded Joints

Where indicated, a metallic bond shall be provided at each joint, including joints made with flexible couplings or rubber gaskets, of ferrous-metallic piping to effect continuous conductivity. The bond shall be of the thermal-weld type.

3.2 HYDROSTATIC TESTS

The pipeline shall be subjected to both a pressure test and a leakage test.

The method proposed for disposal of waste water from hydrostatic tests shall be approved by the Contracting Officer. Testing shall be the responsibility of the Contractor. Testing shall be performed by an approved independent testing laboratory or by the Contractor subject to approval. The test may be witnessed by the Contracting Officer. The Contracting Officer shall be notified at least 7 days in advance of equipment tests. The final test report shall be delivered to the Contracting Officer within 30 days of the test.

3.2.1 Pressure Test

After the pipe has been installed, joints completed, and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour. Each valve shall be opened and closed several times during the test. The exposed pipe, joints, fitting, and valves shall be examined for leaks. Visible leaks shall be stopped or the defective pipe, fitting, joints, or valve shall be replaced.

3.2.2 Leakage Test

The leakage test may be conducted subsequent to or concurrently with the pressure test. The amount of water permitted as leakage for the line shall be placed in a sealed container attached to the supply side of the test pump. No other source of supply will be permitted to be applied to the

pump or line under test. The water shall be pumped into the line by the test pump as required to maintain the specified test pressure as described for pressure test for a 2 hour period. Exhaustion of the supply or the inability to maintain the required pressure will be considered test failure. PE pipe can experience diametric expansion and pressure elongation during initial testing. The manufacturer shall be consulted prior to testing for special testing considerations. Allowable leakage shall be determined by the following I-P formula:

$L = NDP/K$ Where:

L = Allowable leakage in gallons per hour.

N = Number of joints in length of pipeline tested.

D = Nominal diameter of the pipe in inches.

P = Square root of the test pressure in psig.

K = 7400 for pipe materials.

At the conclusion of the test, the amount of water remaining in the container shall be measured and the results recorded in the test report.

3.2.3 Retesting

If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted until the results of the tests are within specified allowances, without additional cost to the Government.

-- End of Section --

SECTION 02571
PAVEMENT REMOVAL AND REPLACEMENT

03/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M140	1987 (R 1988) Emulsified Asphalt
AASHTO M208	1987 Cationic Emulsified Asphalt
AASHTO M226	1980 (R 1986) Viscosity Graded Asphalt Cement

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 698	1978 (R 1990) Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in. (305-mm) Drop
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DEPARTMENT OF TRANSPORTATION (DOT)

DOT D-6.1	1988 Uniform Traffic Control Devices for Streets and Highway
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VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT)

VDOT RBS	1994 Road and Bridge Specifications
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-05 Design Data

Job Mix Formula

Submit the mix design, including mixing temperature. The bituminous mix design shall include a certified laboratory analysis of mix composition with marshall stability value, void content, and flow. After mix design approval, job mixes shall conform to the range of tolerances specified in VDOT RBS.

SD-07 Certificates

Aggregates

Bituminous Mixture

1.3 QUALITY ASSURANCE

1.3.1 Modification to References

Except as specified herein, work and materials shall be in accordance with the VDOT RBS. The provisions therein for method of measurement and payment do not apply, and references to "Engineer" shall mean the Contracting Officer (CO).

1.4 BARRICADES AND SIGNALS

Provide and maintain temporary signs, signals, lighting devices, markings, barricades, and channelizing and hand signaling devices as required in accordance with DOT D-6.1 to protect personnel and new construction from damage by equipment and vehicles until the surface is approved by the CO. Work shall be conducted to permit a minimum of one traffic lane on two lane streets, to be open for traffic at all times.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Bituminous Concrete

VDOT RBS, Section 212 (Revised), Type SM-2A for material and mix. Provide crushed stone aggregate for the bituminous mix.

2.1.2 Stone Base Course

VDOT RBS, Sections 203 and 209, Type 1, size no. 20, 21, 21A or 21B.

2.1.3 Bituminous Tack Coat

2.1.3.1 Emulsified Asphalts

AASHTO M140, Grades RS-1, MS-1, HFMS-1, SS-1, and SS-1h. Dilute the SS-1 and SS-1h asphalts at the rate of one part water to one part asphalt.

2.1.3.2 Cationic Emulsified Asphalts

AASHTO M208, Grades CRS-1, CSS-1, and CSS-1h. Dilute the CSS-1 and CSS-1h asphalts at the rate of one part water to one part asphalt.

2.1.3.3 Asphalt Cements

AASHTO M226, Grade AC-20.

PART 3 EXECUTION

3.1 PAVEMENT INSTALLATION

The work includes the removal of existing pavement and the provision of new pavement where trenches, pits, and other excavations are made in the

existing pavement. Except as otherwise indicated, the restored pavement area shall be the same kind and thickness as previously existed, and shall match and tie into the surrounding pavement in a neat and acceptable manner.

3.2 ROADS AND PARKING AREAS

3.2.1 Pavement Removal

Make a straight line sawcut 12 inches beyond the edge of the excavation to full pavement depth for bituminous concrete pavement and a minimum 6 inches for Portland cement concrete pavement. Portland cement concrete pavement overlaid with bituminous concrete shall be sawcut to a minimum depth of 8 inches. The pavement shall be broken up and removed, along with its base and subgrade, to the depth indicated or specified.

3.2.2 Subgrade Placement

Provide as specified in Section 02316 Excavation, Trenching, and Backfilling for Utilities Systems.

3.2.3 Stone Base Placement

Provide a stone base course a minimum of 6 inches thick, unless indicated otherwise. Place the stone base in two equal lifts, with each lift compacted to 100 percent ASTM D 698 maximum density. At the Contractor's option, bituminous concrete approved for use as the surface coat may be provided in lieu of stone base material.

3.2.4 Bituminous Concrete Placement

Provide a tack coat on the exposed edges of the cold joints and on the bituminous concrete base if provided, and provide a minimum 1-1/2 inches thick bituminous concrete surface course, unless indicated otherwise, in accordance with VDOT RBS. Place in one lift compacted to 96 percent of maximum laboratory density. The finished surface shall be uniform in texture and appearance and free of cracks and creases.

3.2.5 Portland Cement Concrete Pavement

Provide as specified in Section 03307A. Provide reinforcing as indicated. The concrete surface shall be struck off, screeded, tamped, and finished to the same surface elevation and texture as the adjacent existing concrete. Cure concrete for 7 days. Maintain existing joint patterns.

3.2.6 Bituminous Concrete Overlay

For Portland cement concrete pavement overlaid with bituminous concrete pavement, provide the Portland cement concrete pavement and bituminous concrete pavement as specified above, except provide a tack coat at the rate of 0.10 gallon of residual asphalt per square yard on the restored Portland cement concrete base. Allow tack coat to become tacky prior to bituminous concrete placement. Apply the tack coat and bituminous concrete pavement only when the Portland cement concrete base surface is clean and dry, and has cured for a minimum of 7 days.

3.3 MATERIAL DISPOSAL

Removed pavement, base and subgrade materials shall be disposed of as directed by the Contracting Officer.

-- End of Section --

SECTION 02770A

CONCRETE SIDEWALKS, PATIOS, AND CURBS AND GUTTERS
03/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 182 (1991) Burlap Cloth Made from Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31/C 31M (1996) Making and Curing Concrete Test Specimens in the Field

ASTM C 143 (1990a) Slump of Hydraulic Cement Concrete

ASTM C 171 (1997) Sheet Materials for Curing Concrete

ASTM C 172 (1997) Sampling Freshly Mixed Concrete

ASTM C 173 (1996) Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM C 231 (1997) Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 920 (1995) Elastomeric Joint Sealants

ASTM D 1751 (1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D 1752 (1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

ASTM D 3405 (1996) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Concrete

Copies of certified delivery tickets for all concrete used in the construction.

SD-06 Test Reports

Field Quality Control

Copies of all test reports within 24 hours of completion of the test.

1.3 WEATHER LIMITATIONS

1.3.1 Placing During Cold Weather

Concrete placement shall not take place when the air temperature reaches 40 degrees F and is falling, or is already below that point. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement and protection shall be approved in writing.

Approval will be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water and aggregates shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.3.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 95 degrees F at any time.

1.4 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.4.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

PART 2 PRODUCTS

2.1 CONCRETE

- a. Concrete shall conform to the applicable requirements of Section 03307A CONCRETE FOR MINOR STRUCTURES, except as otherwise specified. Concrete shall have a minimum compressive strength of 3500 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches.
- b. All sidewalks, patios, curbs and gutters, and other exposed concrete shall be Langley AFB Standard Miami Buff color concrete.
- c. Where concrete is being patched into existing concrete, it shall match the color of the adjacent concrete.

2.1.1 Air Content

Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.1.2 Slump

The concrete slump shall be 2 inches plus or minus 1 inch where determined in accordance with ASTM C 143.

2.2 CONCRETE CURING MATERIALS

2.2.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.2.2 Burlap

Burlap shall conform to AASHTO M 182.

2.3 CONCRETE PROTECTION MATERIALS

Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.4 JOINT FILLER STRIPS

2.4.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

2.4.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 3/8 inch thick, unless otherwise indicated.

2.5 JOINT SEALANTS

2.5.1 Joint Sealant, Cold-Applied

Joint sealant, cold-applied shall conform to ASTM C 920.

2.5.2 Joint Sealant, Hot-Poured

Joint sealant, hot-poured shall conform to ASTM D 3405.

2.6 FORM WORK

Form work shall be designed and constructed to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of 3 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.6.1 Sidewalk and Patio Forms

Forms shall be of a height equal to the full depth of the finished sidewalk and patios.

2.6.2 Curb and Gutter Forms

Curb and gutter outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement. Subgrade shall be placed and compacted in conformance with Section 02315A EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS.

3.1.1 Sidewalk and Patio Subgrade

The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and patio, supported between side

forms.

3.1.2 Curb and Gutter Subgrade

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

3.1.3 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected to produce a subgrade free from frost when the concrete is deposited.

3.2 FORM SETTING

Forms shall be set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Sidewalks and Patios

Forms for sidewalks and patios shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment shall be checked with a 10 foot straightedge. Forms shall have a transverse slope as indicated or 1/4 inch per foot with the low side adjacent to the roadway or away from the building. Side forms shall not be removed for 12 hours after finishing has been completed.

3.2.2 Curbs and Gutters

The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished, as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction.

3.3 SIDEWALK AND PATIO CONCRETE PLACEMENT AND FINISHING

3.3.1 Formed Sidewalks and Patios

Concrete shall be placed in the forms in one layer. When consolidated and finished, the sidewalks and patios shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted.

The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a strike off.

3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished with a wood float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

3.3.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

3.4.1 Formed Curb and Gutter

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators. Curve shaped gutters shall be finished with a standard curb "mule".

3.4.2 Concrete Finishing

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

3.4.3 Joint Finishing

Curb edges at formed joints shall be finished as indicated.

3.4.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.5 SIDEWALK AND PATIO JOINTS

Sidewalk and patio joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks and patios

10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk and patio pavement, using joint filler of the type, thickness, and width indicated.

3.5.1 Sidewalk and Patio Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

3.5.2 Sidewalk and Patio Expansion Joints

Expansion joints shall be formed with 1/2 inch joint filler strips. Joint filler shall be placed with top edge 1/4 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be cleaned and filled with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.6 CURB AND GUTTER JOINTS

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

3.6.1 Contraction Joints

Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Contraction joints shall be constructed by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

3.6.2 Expansion Joints

Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, expansion joints at least 1/2 inch in width shall be provided at intervals not exceeding 30 feet. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Expansion joints and the top 1 inch depth of curb and gutter contraction-joints shall be sealed with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.7 CURING AND PROTECTION

3.7.1 General Requirements

Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

3.7.1.1 Mat Method

The entire exposed surface shall be covered with 2 or more layers of burlap. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.7.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall not be less than 18-inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

3.7.2 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding

area in accordance with lines and grades indicated.

3.7.3 Protection

Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

3.7.4 Protective Coating

Protective coating of linseed oil mixture shall be applied to the exposed-to-view concrete surface.

3.7.4.1 Application

Curing and backfilling operation shall be completed prior to applying two coats of protective coating. Concrete shall be surface dry and clean before each application. Coverage shall be by spray application at not more than 50 square yards per gallon for first application and not more than 70 square yards per gallon for second application, except that the number of applications and coverage for each application for commercially prepared mixture shall be in accordance with the manufacturer's instructions. Coated surfaces shall be protected from vehicular and pedestrian traffic until dry.

3.7.4.2 Precautions

Protective coating shall not be heated by direct application of flame or electrical heaters and shall be protected from exposure to open flame, sparks, and fire adjacent to open containers or applicators. Material shall not be applied at ambient or material temperatures lower than 50 degrees F.

3.8 FIELD QUALITY CONTROL

3.8.1 General Requirements

The Contractor shall perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing.

Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

3.8.2 Concrete Testing

3.8.2.1 Strength Testing

The Contractor shall provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 250 cubic yards of concrete. The samples for strength tests shall be taken in accordance with ASTM C 172. Cylinders for acceptance shall be molded in conformance with ASTM C 31/C 31M by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the

basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

3.8.2.2 Air Content

Air content shall be determined in accordance with ASTM C 173 or ASTM C 231.

ASTM C 231 shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Government inspector.

If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

3.8.2.3 Slump Test

Two slump tests shall be made on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

3.8.3 Thickness Evaluation

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine.

If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

3.8.4 Surface Evaluation

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

3.9 SURFACE DEFICIENCIES AND CORRECTIONS

3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch.

Pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

-- End of Section --

SECTION 02921N

TURF
09/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602	(1995; Rev. A) Agricultural Liming Materials
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act	(January 1985) Federal Seed Act Rules and Regulations of the Secretary of Agriculture
DOA SSIR	(April 1984) Soil Survey Investigation Report No. 1, Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples, Soil Conservation Service

1.2 DEFINITIONS

1.2.1 Stand of Turf

95 percent ground cover of the established species.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Fertilizer

Include physical characteristics, and recommendations.

SD-06 Test Reports

Topsoil composition tests (reports and recommendations).

SD-07 Certificates

State certification and approval for seed

SD-08 Manufacturer's Instructions

Erosion Control Materials

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Seed Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

1.4.1.2 Fertilizer, Iron, and Lime Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer, iron, and lime may be furnished in bulk with certificate indicating the above information.

1.4.2 Storage

1.4.2.1 Seed, Fertilizer, Iron, and Lime Storage

Store in cool, dry locations away from contaminants.

1.4.2.2 Topsoil

Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.

1.4.2.3 Handling

Do not drop or dump materials from vehicles.

1.5 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.5.1 Restrictions

Do not plant when the ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.6 TIME LIMITATIONS

1.6.1 Seed

Apply seed within twenty four hours after seed bed preparation.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Classification

Provide State-certified seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with AMS Seed Act and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected.

2.1.2 Seed Mixture

See mixtures shall be proportioned by weight as follows:

PLANTING SEASON	COMMON NAME	MIXTURE PERCENT BY WEIGHT	PERCENT PURE LIVE SEED
Season 1 Spring	Common Bermuda (Hulled)	100	99
Season 2 Summer	Fescue (KY31)	50	99
Season 3 Fall	Common Bermuda (Unhulled)	50	99
	Annual Rye	100	99

Proportion seed mixtures by weight. Seeding during Season 3 is for temporary ground cover which must later be replaced by Season 1 plantings for a permanent stand of grass. The same requirements for turf establishment apply for Season 1 as for Season 3.

2.1.3 Planting Dates

Season 1	Season 2	Season 3
May 15 to August 15	Aug 16 to Oct 2	Oct 3 to Apr 30
2 lbs/1000 sq. ft.	12 lbs/1000 sq. ft.	6 lbs/1000 sq. ft.

2.2 TOPSOIL

2.2.1 Existing Soil

Modify existing soil to conform to the requirements specified in paragraph entitled "Composition."

2.2.2 On-Site Topsoil

Reusable surface soil stripped and stockpiled on site if requirements specified for topsoil in paragraph entitled "Composition" are met.

2.2.3 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.

2.2.4 Composition

Containing from 5 to 8 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. Other components shall be within the

following percentages:

Silt	25-50
Clay	10-30
Sand	20-35
pH	5 to 7.6
Soluble Salts	600 ppm maximum

2.3 pH ADJUSTERS

Amended by addition of lime as a pH adjuster at the rate necessary to bring the soil pH within a range of 6.2 to 7.0.

2.3.1 Lime

ASTM C 602, commercial agricultural limestone containing a minimum of 94 percent of total carbonates, 30 percent calcium, and 14 percent magnesium. Provide the following ASTM E 11 gradation: minimum 86 percent passing the No. 20 sieve and 28 percent passing the No. 100 sieve.

2.3.2 Iron

100 percent elemental.

2.4 SOIL CONDITIONERS

Provide singly or in combination as required to meet specified requirements for topsoil. Soil conditioners shall be nontoxic to plants.

2.4.1 Peat

Peat humus derived from a bog, swampland, or marsh shall conform to ASTM D 2607 as modified herein. Shred and granulate peat to pass 1/2 inch mesh screen and condition in storage pile for minimum 6 months after excavation.

2.4.2 Sand

Clean and free of materials harmful to plants.

2.4.3 Composted Derivatives

Ground bark, nitrolized sawdust, humus, or other wood green waste material free of stones, sticks, and soil stabilized with nitrogen and having the following properties:

2.4.3.1 Particle Size

Minimum percent by weight passing:

No. 4 mesh screen	95
No. 8 mesh screen	80

2.4.3.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.5 FERTILIZER

2.5.1 Controlled Release Fertilizer

Nitrogen-phosphorous-potassium ration of 16-7-12 plus 2 percent iron, composed of pills coated with plastic resin to provide continuous release of fertilizer for at least 6 months.

2.6 SURFACE TOPDRESSING

Free from, noxious weeds, mold, and other deleterious materials.

2.7 WATER

Source of water to be approved by Contracting Officer, suitable quality for irrigation.

2.8 EROSION CONTROL MATERIALS

2.8.1 Net

Heavy, twisted jute mesh, plastic net, biodegradable paper fabric with knitted yarns, or standard weave burlap.

2.8.2 Blanket

Fiber.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 EXTENT OF WORK

Provide soil preparation, fertilizing, and seeding of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.1.2 Soil Preparation

Remove existing topsoil to a full depth and stockpile. After areas have been brought to finish subgrade elevation, thoroughly till to minimum depth of 6 inches by scarifying, disking, harrowing, or other methods approved by the Contracting Officer. Remove debris and stones larger than one inch in any dimension remaining on surface after tillage. Spread stockpiled topsoil evenly to provide positive drainage. Provide off-site topsoil to meet indicated finish grade. Do not spread topsoil when frozen or excessively wet or dry. Thoroughly mix subgrade and topsoil and off-site topsoil to a depth of 8 inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Correct irregularities in finished surfaces to eliminate depressions. Protect finished prepared soil areas from damage by vehicular or pedestrian traffic.

3.1.2.1 pH Adjuster Application Rates

Apply pH adjuster at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

Lime 70 pounds per 1000 square feet.

3.1.2.2 Soil Conditioner Application Rates

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site.

3.1.2.3 Fertilizer Application Rates

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

Organic Fertilizer 23 pounds per 1000 square feet.

3.2 SEEDING

3.2.1 Seed Application Seasons and Conditions

Immediately before seeding, restore soil to proper grade and thoroughly moisten soil to a depth of 6 inches. Do not seed when ground is muddy, frozen, snow covered, or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in the above seeding dates or conditions, submit a written request to the Contracting Officer stating the special conditions and proposed variance. Apply seed within twenty four hours after seedbed preparation. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

3.2.2 Seed Application Method

3.2.2.1 Hydroseeding

First, mix water and fiber. Fiber shall be added at 1,000 pounds, dry weight, per acre. Then add and mix seed and fertilizer to produce a homogeneous slurry. When hydraulically sprayed on the ground, material shall form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

3.2.3 Rolling

Immediately after seeding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width. If seeding is performed by hydroseeding, rolling may be eliminated.

3.2.4 Erosion Control Material

Install in accordance with manufacturer's instructions.

3.2.5 Watering

Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of 6 inches without run off. During the germination process, seed is to be kept actively growing and not allowed to dry out.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use or as directed by Contracting Officer.

3.4 RESTORATION

Restore to original condition existing turf areas which have been damaged during turf installation operations. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --

SECTION 03307A

CONCRETE FOR MINOR STRUCTURES
11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 308	(1992; R 1997) Standard Practice for Curing Concrete
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary
ACI 347R	(1994; R 1999) Guide to Formwork for Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615/A 615M	(2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 143/C 143M	(2000) Slump of Hydraulic Cement Concrete
ASTM C 150	(1999a) Portland Cement
ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2000e1) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1999ae1) Concrete Aggregates
ASTM C 39/C 39M	(2001) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 494/C 494M	(1999ae1) Chemical Admixtures for Concrete
ASTM C 618	(2000) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 685	(2000) Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C 920	(1998) Elastomeric Joint Sealants
ASTM C 94/C 94M	(2000e2) Ready-Mixed Concrete
ASTM D 1752	(1984; R 1996e1) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 98	(1998) Calcium Chloride
ASTM E 96	(2000) Water Vapor Transmission of Materials
U.S. ARMY CORPS OF ENGINEERS (USACE)	
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Air-Entraining Admixture
Accelerating Admixture
Water-Reducing or Retarding Admixture
Curing Materials
Reinforcing Steel
Expansion Joint Filler Strips, Premolded
Joint Sealants - Field Molded Sealants

Manufacturer's literature is available from suppliers which demonstrates compliance with applicable specifications for the above materials.

Batching and Mixing Equipment

Batching and mixing equipment will be accepted on the basis of manufacturer's data which demonstrates compliance with the applicable specifications.

Conveying and Placing Concrete

The methods and equipment for transporting, handling, depositing, and consolidating the concrete shall be submitted prior to the first concrete placement.

Formwork

SD-06 Test Reports

Aggregates

Aggregates will be accepted on the basis of certificates of compliance and test reports that show the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

Concrete Mixture Proportions

Ten days prior to placement of concrete, the contractor shall submit the mixture proportions that will produce concrete of the quality required. Applicable test reports shall be submitted to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

SD-07 Certificates

Cementitious Materials

Certificates of compliance attesting that the concrete materials meet the requirements of the specifications shall be submitted in accordance with the Special Clause "CERTIFICATES OF COMPLIANCE". Cementitious material will be accepted on the basis of a manufacturer's certificate of compliance, accompanied by mill test reports that the material(s) meet the requirements of the specification under which it is furnished.

Aggregates

Aggregates will be accepted on the basis of certificates of compliance and tests reports that show the material(s) meet the quality and grading requirements of the specifications under which it is furnished.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

The Government will maintain the option to sample and test joint sealer, joint filler material, waterstop, aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary to assist the Government in procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Concrete will be sampled in accordance with ASTM C 172. Slump and air content will be determined in accordance with ASTM C 143/C 143M and ASTM C 231, respectively, when cylinders are molded. Compression test specimens will be made, cured, and transported in accordance with ASTM C 31/C 31M. Compression test specimens will be tested in accordance with ASTM C 39/C 39M.

Samples for strength tests will be taken not less than once each shift in which concrete is produced from each class of concrete required. A minimum of three specimens will be made from each sample; two will be tested at 28 days (90 days if pozzolan is used) for acceptance, and one will be tested

at 7 days for information.

1.3.1 Strength

Acceptance test results will be the average strengths of two specimens tested at 28 days (90 days if pozzolan is used). The strength of the concrete will be considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed the specified compressive strength, f'_c , and no individual acceptance test result falls below f'_c by more than 500 psi.

1.3.2 Construction Tolerances

A Class "C" finish shall apply to all surfaces except those specified to receive a Class "D" finish. A Class "D" finish shall apply to all surfaces which will be permanently concealed after construction. The surface requirements for the classes of finish required shall be as specified in ACI 347R.

1.3.3 Concrete Mixture Proportions

Concrete mixture proportions shall be the responsibility of the Contractor.

Mixture proportions shall include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic yard of concrete. All materials included in the mixture proportions shall be of the same type and from the same source as will be used on the project. Specified compressive strength f'_c shall be 3,000 psi at 28 days (90 days if pozzolan is used). The maximum nominal size coarse aggregate shall be 1-1/2 inches, in accordance with ACI 318/318R.

The air content shall be between 4.5 and 7.5 percent. The slump shall be between 2 and 5 inches. The maximum water cement ratio shall be 0.50.

1.4 REGULATORY REQUIREMENTS

The state statutory and regulatory requirements listed below form a part of this specification to the extent referenced.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall conform to the appropriate specifications listed:

2.1.1.1 Portland Cement

ASTM C 150, Type I, IA, II, IIA, III, IIIA or V, except that the tricalcium aluminate of the Type III or IIIA cement shall be limited to 8 percent.

2.1.1.2 Pozzolan

Pozzolan shall conform to ASTM C 618, Class C or F, including requirements of Tables 1A and 2A.

2.1.2 Aggregates

Aggregates shall meet the quality and grading requirements of ASTM C 33 Class Designations 4M or better.

2.1.1.3 Admixtures

Admixtures to be used, when required or approved, shall comply with the appropriate specification listed. Chemical admixtures that have been in storage at the project site for longer than 6 months or that have been subjected to freezing shall be retested at the expense of the contractor at the request of the Contracting Officer and shall be rejected if test results are not satisfactory.

2.1.3.1 Air-Entraining Admixture

Air-entraining admixture shall meet the requirements of ASTM C 260.

2.1.3.2 Accelerating Admixture

Calcium chloride shall meet the requirements of ASTM D 98. Other accelerators shall meet the requirements of ASTM C 494/C 494M, Type C or E.

2.1.3.3 Water-Reducing or Retarding Admixture

Water-reducing or retarding admixture shall meet the requirements of ASTM C 494/C 494M, Type A, B, or D. High-range water reducing admixture Type F may be used only when approved, approval being contingent upon particular placement requirements as described in the Contractor's Quality Control Plan.

2.1.4 Water

Water for mixing and curing shall be fresh, clean, potable, and free from injurious amounts of oil, acid, salt, or alkali, except that unpotable water may be used if it meets the requirements of COE CRD-C 400.

2.1.5 Reinforcing Steel

Reinforcing steel bar shall conform to the requirements of ASTM A 615/A 615M, Grade 60. Welded steel wire fabric shall conform to the requirements of ASTM A 185. Details of reinforcement not shown shall be in accordance with ACI 318/318R, Chapters 7 and 12.

2.1.6 Expansion Joint Filler Strips, Premolded

Expansion joint filler strips, premolded shall be sponge rubber conforming to ASTM D 1752, Type I.

2.1.7 Joint Sealants - Field Molded Sealants

Joint sealants - field molded sealants shall conform to ASTM C 920, Type M, Grade NS, Class 25, use NT for vertical joints and Type M, Grade P, Class 25, use T for horizontal joints. Bond-breaker material shall be polyethylene tape, coated paper, metal foil, or similar type materials. The backup material shall be compressible, nonshrink, nonreactive with the sealant, and a nonabsorptive material such as extruded butyl or polychloroprene foam rubber. Immediately prior to installation of field-molded sealants, the joint shall be cleaned of all debris and further cleaned using water, chemical solvents, or other means as recommended by

the sealant manufacturer or directed.

2.1.8 Formwork

The design and engineering of the formwork as well as its construction, shall be the responsibility of the Contractor.

2.1.9 Form Coatings

Forms for exposed surfaces shall be coated with a nonstaining form oil, which shall be applied shortly before concrete is placed.

2.1.10 Vapor Barrier

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

2.1.11 Curing Materials

Curing materials shall conform to the following requirements.

2.1.11.1 Impervious Sheet Materials

Impervious sheet materials, ASTM C 171, type optional, except polyethylene film, if used, shall be white opaque.

2.1.11.2 Membrane-Forming Curing Compound

ASTM C 309, Type 1-D or 2, Class A.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 General

Construction joints shall be prepared to expose coarse aggregate, and the surface shall be clean, damp, and free of laitance. Ramps and walkways, as necessary, shall be constructed to allow safe and expeditious access for concrete and workmen. Snow, ice, standing or flowing water, loose particles, debris, and foreign matter shall have been removed. Earth foundations shall be satisfactorily compacted. Spare vibrators shall be available. The entire preparation shall be accepted by the Government prior to placing.

3.1.2 Embedded Items

Reinforcement shall be secured in place; joints, anchors, and other embedded items shall have been positioned. Internal ties shall be arranged so that when the forms are removed the metal part of the tie will be not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Embedded items shall be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. All equipment needed to place, consolidate, protect, and cure the concrete shall be at the placement site and in good operating condition.

3.1.3 Formwork Installation

Forms shall be properly aligned, adequately supported, and mortar-tight. The form surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. All exposed joints and edges shall be chamfered, unless otherwise indicated.

3.1.4 Vapor Barrier Installation

Vapor barriers shall be applied over gravel fill. Edges shall be lapped not less than 6 inches. All joints shall be sealed with pressure-sensitive adhesive not less than 2 inches wide. The vapor barrier shall be protected at all times to prevent injury or displacement prior to and during concrete placement.

3.1.5 Production of Concrete

3.1.5.1 Ready-Mixed Concrete

Ready-mixed concrete shall conform to ASTM C 94/C 94M except as otherwise specified.

3.1.5.2 Concrete Made by Volumetric Batching and Continuous Mixing

Concrete made by volumetric batching and continuous mixing shall conform to ASTM C 685.

3.1.5.3 Batching and Mixing Equipment

The contractor shall have the option of using an on-site batching and mixing facility. The facility shall provide sufficient batching and mixing equipment capacity to prevent cold joints. The method of measuring materials, batching operation, and mixer shall be submitted for review.

3.2 CONVEYING AND PLACING CONCRETE

Conveying and placing concrete shall conform to the following requirements.

3.2.1 General

Concrete placement shall not be permitted when weather conditions prevent proper placement and consolidation without approval. When concrete is mixed and/or transported by a truck mixer, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours or 45 minutes when the placing temperature is 85 degrees F or greater unless a retarding admixture is used. Concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods which prevent segregation or loss of ingredients. Concrete shall be in place and consolidated within 15 minutes after discharge from the mixer. Concrete shall be deposited as close as possible to its final position in the forms and be so regulated that it may be effectively consolidated in horizontal layers 18 inches or less in thickness with a minimum of lateral movement. The placement shall be carried on at such a rate that the formation of cold joints will be prevented.

3.2.2 Consolidation

Each layer of concrete shall be consolidated by rodding, spading, or internal vibrating equipment. Internal vibration shall be systematically

accomplished by inserting the vibrator through the fresh concrete in the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1.5 times the radius of action of the vibrator and overlay the adjacent, just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the layer below, if such a layer exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly at the rate of about 3 inches per second.

3.2.3 Cold-Weather Requirements

No concrete placement shall be made when the ambient temperature is below 35 degrees F or if the ambient temperature is below 40 degrees F and falling. Suitable covering and other means as approved shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing and at a temperature above freezing for the remainder of the curing period. Salt, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing. Any concrete damaged by freezing shall be removed and replaced at the expense of the contractor.

3.2.4 Hot-Weather Requirements

When the rate of evaporation of surface moisture, as determined by use of Figure 1 of ACI 308, is expected to exceed 0.2 pound per square foot per hour, provisions for windbreaks, shading, fog spraying, or covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow.

3.3 FORM REMOVAL

Forms shall not be removed before the expiration of 24 hours after concrete placement except where otherwise specifically authorized. Supporting forms and shoring shall not be removed until the concrete has cured for at least 5 days. When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

3.4 FINISHING

3.4.1 General

No finishing or repair will be done when either the concrete or the ambient temperature is below 50 degrees F.

3.4.2 Finishing Formed Surfaces

All fins and loose materials shall be removed, and surface defects including tie holes shall be filled. All honeycomb areas and other defects shall be repaired. All unsound concrete shall be removed from areas to be repaired. Surface defects greater than 1/2 inch in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete shall be reamed or chipped and filled with dry-pack mortar. The prepared area shall be brush-coated with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filled with mortar or concrete. The cement used in mortar or concrete for repairs to all surfaces permanently exposed to view shall be a blend of portland cement and white cement so that the final color when cured will be the same as adjacent concrete.

3.4.3 Finishing Unformed Surfaces

All unformed surfaces that are not to be covered by additional concrete or backfill shall be float finished to elevations shown, unless otherwise specified. Surfaces to receive additional concrete or backfill shall be brought to the elevations shown and left as a true and regular surface. Exterior surfaces shall be sloped for drainage unless otherwise shown. Joints shall be carefully made with a jointing tool. Unformed surfaces shall be finished to a tolerance of 3/8 inch for a float finish and 5/16 inch for a trowel finish as determined by a 10 foot straightedge placed on surfaces shown on the plans to be level or having a constant slope. Finishing shall not be performed while there is excess moisture or bleeding water on the surface. No water or cement shall be added to the surface during finishing.

3.4.3.1 Float Finish

Surfaces to be float finished shall be screeded and darbied or bullfloated to eliminate the ridges and to fill in the voids left by the screed. In addition, the darby or bullfloat shall fill all surface voids and only slightly embed the coarse aggregate below the surface of the fresh concrete. When the water sheen disappears and the concrete will support a person's weight without deep imprint, floating should be completed. Floating should embed large aggregates just beneath the surface, remove slight imperfections, humps, and voids to produce a plane surface, compact the concrete, and consolidate mortar at the surface.

3.4.3.2 Broom Finish

A broom finish shall be applied to steps and landings. The concrete shall be screeded and floated to required finish plane with no coarse aggregate visible. After surface moisture disappears, the surface shall be broomed or brushed with a broom or fiber bristle brush in a direction transverse to that of the main traffic or as directed.

3.4.3.3 Expansion and Contraction Joints

Expansion and contraction joints shall be made in accordance with the details shown or as otherwise specified. Provide 1/2 inch thick transverse expansion joints where new work abuts an existing concrete.

3.5 CURING AND PROTECTION

Beginning immediately after placement and continuing for at least 7 days, except for concrete made with Type III cement, at least 3 days, all concrete shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to the start of concrete placement. Preservation of moisture for concrete surfaces not in contact with forms shall be accomplished by one of the following methods:

- a. Continuous sprinkling or ponding.
- b. Application of absorptive mats or fabrics kept continuously wet.
- c. Application of sand kept continuously wet.

- d. Application of impervious sheet material conforming to ASTM C 171.
- e. Application of membrane-forming curing compound conforming to ASTM C 309, Type 1-D, on surfaces permanently exposed to view and Type 2 on other surfaces shall be accomplished in accordance with manufacturer's instructions.

The preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days, except for concrete made with Type III cement, 3 days. If forms are removed prior to end of the required curing period, other curing methods shall be used for the balance of the curing period. During the period of protection removal, the temperature of the air in contact with the concrete shall not be allowed to drop more than 25 degrees F within a 24 hour period.

3.6 TESTS AND INSPECTIONS

3.6.1 General

The individuals who sample and test concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

3.6.2 Inspection Details and Frequency of Testing

3.6.2.1 Preparations for Placing

Foundation or construction joints, forms, and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor to certify that it is ready to receive concrete.

3.6.2.2 Air Content

Air content shall be checked at least once during each shift that concrete is placed for each class of concrete required. Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 231.

3.6.2.3 Slump

Slump shall be checked twice during each shift that concrete is produced for each class of concrete required. Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 143/C 143M.

3.6.2.4 Consolidation and Protection

The Contractor shall ensure that the concrete is properly consolidated, finished, protected, and cured.

3.6.3 Action Required

3.6.3.1 Placing

The placing foreman shall not permit placing to begin until he has verified that an adequate number of acceptable vibrators, which are in working order and have competent operators, are available. Placing shall not be continued if any pile is inadequately consolidated.

3.6.3.2 Air Content

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment shall be made to the dosage of the air-entrainment admixture.

3.6.3.3 Slump

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment should be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the water-cement ratio does not exceed that specified in the submitted concrete mixture proportion.

3.6.4 Reports

The results of all tests and inspections conducted at the project site shall be reported informally at the end of each shift and in writing weekly and shall be delivered within 3 days after the end of each weekly reporting period. See Section 01451 CONTRACTOR QUALITY CONTROL.

-- End of Section --

SECTION 03900

RESTORATION OF CONCRETE IN HISTORIC STRUCTURES
12/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 224.1R (1993) Causes, Evaluation, and Repair of
Cracks in Concrete Structures

ACI 315 (1992) Details and Detailing of Concrete
Reinforcement

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 881 (1999) Epoxy-Resin-Base Bonding Systems for
Concrete

1.2 GENERAL REQUIREMENTS

The Contractor shall be responsible for equipment, materials, testing, labor and other items and services required to accomplish the work. Equipment and techniques proposed for use in the work shall not be used until they have been demonstrated and approved. Materials and equipment which have not been approved for use in the work shall not be stored or brought on to Government property. The Contractor shall provide equipment, materials, and labor to demonstrate materials, equipment, and techniques proposed for use in the work. The demonstrations shall be performed at the site, at a time and location as directed. The demonstration shall include surface cleaning, excavation, surface patching (including finishing, texturing, and curing materials and methods), curing, safety procedures, surface finish and appearance. The Contractor's quality control shall conform to Section 01451 CONTRACTOR QUALITY CONTROL. All sampling and testing shall be the Contractor's responsibility, and shall be performed by an approved independent commercial testing laboratory, except as otherwise specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Materials; G.

Certificates of compliance attesting that the materials meet specification requirements.

1.4 EQUIPMENT

Equipment that is dependable and adequate to accomplish the specified work shall be assembled at the work site in sufficient time before the start of the work to permit thorough inspection, calibration of weighing and measuring devices, adjustment of parts, and the making of any repairs that may be required. The equipment shall be maintained in acceptable working condition during the life of the project.

1.4.1 Cleaning

Equipment used in cleaning shall not cause staining, erosion, marring, or other damage or changes in the appearance of the surfaces to be cleaned.

1.4.1.1 Water Blasting

Water blasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water re-supply equipment. The equipment shall not be operated at a pressure which will cause etching or other damage to the concrete surface, except for the surfaces of the interior of the excavation, where operation at higher pressures may be used, subject to specific approval. The equipment shall be operated at a discharge capacity of 55 psi maximum and 2.5 to 3 gpm for general surface cleaning operations of the structure, and between 500 and 1000 psi and 2.5 to 3 gpm for cleaning of drill holes and surfaces of excavations. The water tank and auxiliary re-supply equipment shall be of sufficient capacity to permit continuous operations. The Contractor shall provide protective covers and barriers as required to prevent over-spray onto adjacent surfaces.

1.4.2 Compressed Air Supplies

Compressed air shall provide clean, oil and moisture free compressed air at the surface to be cleaned. The compressed air line shall have at least two in-line air filters to remove oil and moisture from the air supply. The compressed air supply shall be tested during each shift for the presence of oil and moisture.

1.5 SPECIFIC REQUIREMENTS

1.6 STORAGE OF MATERIALS

Labeling of packages shall clearly define contents, manufacturer, batch identification, etc. Epoxy shall be stored in accordance with the manufacturer's recommendations.

1.7 WEATHER LIMITATIONS

Epoxy adhesives shall not be placed when weather conditions detrimentally affect the quality of the finished product. Materials proposed for use in the work shall not be produced and placed during periods of rain or other precipitation. Material placements shall be stopped and all in-place material shall be protected from exposure during periods of rain or other precipitation.

PART 2 PRODUCTS

2.1 MATERIALS

Materials, physical and chemical properties, and composition of new concrete shall match that of existing concrete to be repaired, unless samples and testing determine that existing mixtures and materials are faulty or non-performing.

2.1.1 Epoxy Anchor Adhesives

An epoxy-resin grout shall be used to bond steel anchors to concrete, and shall be a 100 percent solids, moisture insensitive, low creep, structural adhesive. The epoxy shall conform to ASTM C 881, type IV; grade and class selected to conform to the manufacturer's recommendations for the application. The epoxy adhesive shall be conditioned, proportioned, mixed, and applied in accordance with the manufacturer's recommendations, except as otherwise specified herein or indicated on the drawings.

2.1.2 Cleaning Solution

The cleaning solution shall consist of a 1:1 to 1:1.5 (water: liquid chlorine bleach) mixture of clean potable water and liquid chlorine bleach. Rinse water shall be clean potable water.

2.1.3 Water

Water used in cleaning concrete surfaces, used in producing concrete and mortars, and used for curing concrete shall be potable.

2.1.4 Epoxy-Resin Grout

Epoxy-resin grout shall be a two-component material, 100 percent solids by weight, formulated to meet the requirements of ASTM C 881, Type I or II. Type I material shall be used when materials or atmospheric temperatures are 70 degrees F or above. Type II material shall be used when materials or atmospheric temperatures are below 70 degrees F. Epoxy-resin grout shall have the ability to structurally rebond cracks, delaminations, and hollow plane conditions in concrete; shall be insensitive to the presence of water; and shall have the capability to penetrate cracks down to 5 mils in width. Materials shall have been used in similar conditions for a period of at least five years.

2.1.5 Epoxy Injection Ports

Injection ports for epoxy-resin grout shall be designed for the intended use as detailed in this section and shall be made according to the recommendation of the epoxy manufacturer.

PART 3 EXECUTION

3.1 PREPARATION OF CONCRETE SURFACES

3.1.1 Initial Surface Cleaning

The cleaning materials, equipment, and methods shall not result in staining, erosion, marring, or other damage to the surfaces of the structure.

3.1.2 Cleaning of Cracks

The surfaces of the cracks shall be cleaned by water blasting and manual scrubbing methods. Sandblasting shall not be used to clean concrete surfaces. The surfaces of cracks shall be cleaned of dust, dirt, laitance, corrosion, or other contamination. Cracks and voids shall be flushed out with clean water and allowed to dry. Surfaces of the structure and surfaces adjacent to the cracks shall be protected from damage which may result from cleaning operations.

3.1.3 Previously Repaired Cracks

Old caulking or grout shall be removed from previously repaired cracks where it is failing. Loose particles shall be removed from cracks. Cracks shall be cleaned, rinsed with water followed by blowing with filtered, dry, compressed air.

3.2 CONCRETE REPAIR

3.2.1 General Requisites

Cracks shall be repaired per ACI 224.1R. Detailing shall be per ACI 315. Repaired surfaces shall be flush adjacent existing surfaces. Products shall be used in accordance with the manufacturer's instructions.

3.2.2 Patch Anchors

3.2.2.1 Anchor Installation

Anchors shall be cleaned to remove all contaminants which may hinder epoxy bond. Epoxy adhesive shall be pressure injected into the back of the drilled holes. The epoxy shall fill the holes so that when the anchors are inserted, the epoxy completely fills the holes and excess epoxy is not exuded from the holes. Anchors shall be inserted immediately into the holes. The anchors shall be set back from the exterior face at least 1 inch. Anchors shall be installed without breaking or chipping the exposed concrete surface.

3.2.2.2 Cleanup

Excess epoxy and spills shall be removed from the surface of the excavation. The surface of the excavation shall be left in a clean and uncontaminated condition. Spills on adjacent surfaces shall also be removed and surfaces repaired as required.

3.2.3 Mixing Epoxy-Resin Grout Components

Epoxy-resin grout components shall be mixed in the proportions recommended by the manufacturer. The components shall be conditioned from 70 to 85 degrees F for 48 hours prior to mixing. The two epoxy components shall be mixed with a power-driven, explosion-proof stirring device in a metal or polyethylene container having a hemispherical bottom. The polysulfide curing agent component shall be added gradually to the epoxy-resin component with constant stirring until a uniform mixture is obtained. The rate of stirring shall be such that the entrained air is at a minimum.

3.2.3.1 Tools and Equipment

Tools and equipment used further in the work shall be thoroughly cleaned

before the epoxy-resin grout sets.

3.2.3.2 Health and Safety Precautions

Full-face shields shall be provided for all mixing, blending, and placing operations as required. Protective coveralls and neoprene-coated gloves shall be provided for all workers engaged in the operations. Protective creams of a suitable nature for the operation shall be supplied. Adequate fire protection shall be maintained at all mixing and placing operations. Smoking or the use of spark- or flame-producing devices shall be prohibited within 50 feet of mixing and placing operations. The mixing, placing, or storage of epoxy-resin grout or solvent shall be prohibited within 50 feet of any vehicle, equipment, aircraft, or machinery that could be damaged from fire or could ignite vapors from the material.

3.2.3.3 Epoxy Pressure-Injection of Cracks

Cracks shall be pressure-injected using a two component epoxy system with an in-line mixing and metering capability. System shall be capable of injection pressures up to a maximum of 150 psi to ensure complete penetration of the crack. An adequate surface seal shall be applied to the crack or joint to prevent the escape of epoxy. Entry points shall be established along the crack. The crack shall be filled with a 100 percent solid epoxy adhesive. The adhesive shall be injected into the crack at the first entry point with sufficient pressure to advance the epoxy to the next adjacent port. The original port shall be sealed and injection moved to the port at which the epoxy appears. The process shall continue until each joint and crack has been injected for its entire length. Epoxy shall be allowed to cure in accordance with manufacturer's instructions. Sealing materials shall then be removed and surface finished to match adjacent existing surface.

3.3 CURING AND PROTECTION

3.3.1 Epoxy Adhesives

Epoxy adhesives shall be protected and cured in accordance with the manufacturer's recommendations. The adjacent surfaces and ambient conditions shall be maintained within the manufacturer's recommendations. The patch anchors and epoxy adhesive shall be protected from displacement and disturbances.

3.4 FINAL CLEANING

No sooner than 72 hours after completion of the curing period and after joints are sealed, faces and other exposed surfaces of concrete shall be washed down with water applied with a soft bristle brush, then rinsed with clean water. Discolorations which cannot be removed by these procedures, will be considered defective work. Cleaning work shall be done when temperature and humidity conditions are such that surfaces dry rapidly. Adjacent surfaces shall be protected from damage during cleaning operations.

3.5 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations.

3.6 DEFECTIVE WORK

Defective work shall be repaired or replaced, as directed, using approved

procedures.

-- End of Section --1

SECTION 04200A

MASONRY
10/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI SP-66 (1994) ACI Detailing Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1997a) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 153/A 153M	(2000) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 615/A 615M	(2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 67	(2000) Sampling and Testing Brick and Structural Clay Tile
ASTM C 90	(2000) Loadbearing Concrete Masonry Units
ASTM C 91	(1999) Masonry Cement
ASTM C 216	(2000) Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 270	(2000) Mortar for Unit Masonry
ASTM C 476	(1999) Grout for Masonry
ASTM C 494/C 494M	(1999a) Chemical Admixtures for Concrete
ASTM C 641	(1982; R 1998e1) Staining Materials in Lightweight Concrete Aggregates
ASTM C 780	(2000) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C 1072	(2000) Measurement of Masonry Flexural Bond Strength

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Masonry Work

Drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; and wall openings. Bar splice locations shall be shown. Drawings shall be provided showing the location and layout of glass block units. Bent bars shall be identified on a bending diagram and shall be referenced and located on the drawings. Wall dimensions, bar clearances, and wall openings greater than one masonry unit in area shall be shown. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, the approved shop drawings shall be resubmitted with the additional openings shown along with the proposed changes. Location of these additional openings shall be clearly highlighted. The minimum scale for wall elevations shall be 1/4 inch per foot. Reinforcement bending details shall conform to the requirements of ACI SP-66.

SD-03 Product Data

Clay or Shale Brick

SD-04 Samples

Prefaced Concrete Masonry Units

Color samples of three stretcher units and one unit for each type of special shape. Units shall show the full range of color and texture.

Anchors, Ties, and Bar Positioners

1.3 SAMPLE MASONRY PANELS

After material samples are approved and prior to starting masonry work, a minimum of three sample masonry panels shall be constructed for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, the Contractor shall submit written notification to the Contracting Officer's Representative. Sample panels shall not be built in, or as part of the structure, but shall be located where directed.

1.3.1 Configuration

Panels shall be of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project.

1.3.2 Composition

Panels shall show full color range, texture, and bond pattern of the

masonry work. The Contractor's method for mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of the panels. Installation or application procedures for anchors, wall ties, glass block units, CMU control joints, brick expansion joints, insulation, flashing, brick soldier, row lock courses and weep holes shall be shown in the sample panels. Panels that represent reinforced masonry shall contain a 2 by 2 foot opening placed at least 2 feet above the panel base and 2 feet away from all free edges, corners, and control joints. Required reinforcing shall be provided around this opening as well as at wall corners and control joints.

1.3.3 Construction Method

Where anchored veneer walls are required, the Contractor shall demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, the Contractor shall demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. If sealer is specified to be applied to the masonry units, sealer shall be applied to the sample panels. Panels shall be built on a properly designed concrete foundation.

1.3.4 Usage

The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

1.4 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered, handled, stored, and protected to avoid chipping, breakage, and contact with soil or contaminating material.

1.4.1 Masonry Units

Concrete masonry units shall be covered or protected from inclement weather.

In addition, glass block units and prefaced concrete units shall be stored with their finish surfaces covered. Prefabricated lintels shall be marked on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.4.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

1.4.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Sand and aggregates shall be stored in a manner to prevent contamination or segregation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval.

2.2 CLAY OR SHALE BRICK

Color range and texture of clay or shale brick shall match existing brick and shall conform to the approved sample. Clay or shale brick units shall be delivered factory-blended to provide a uniform appearance and color range in the completed wall.

2.2.1 Solid Clay or Shale Brick

Solid clay or shale brick shall conform to ASTM C 216, Type FBS. Brick size shall be modular and the nominal size of the brick used shall be 2-1/4 inches thick, 3-3/4 inches wide, and 7-5/8 inches long.

2.3 CONCRETE MASONRY UNITS (CMU)

Hollow and solid concrete masonry units shall conform to ASTM C 90. Cement shall have a low alkali content and be of one brand.

2.3.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C 641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification.

2.4 PRECAST CONCRETE ITEMS

2.4.1 Splash Blocks

Splash blocks shall be as detailed. Reinforcement shall be the manufacturer's standard.

2.5 MORTAR

Mortar shall be Type S in accordance with the proportion specification of ASTM C 270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate; when

masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Mortar for prefaced concrete masonry unit wainscots shall contain aggregates with 100 percent passing the No. 8 sieve and 95 percent passing the No. 16 sieve. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

2.6 GROUT

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 8 and 10 inches. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements.

2.6.1 Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494/C 494M, Type C.

2.7 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A 153/A 153M, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A 82. Anchors and ties shall be sized to provide a minimum of 5/8 inch mortar cover from either face.

2.7.1 Wall Ties

Wall ties shall be rectangular-shaped or Z-shaped fabricated of 3/16 inch diameter zinc-coated steel wire. Rectangular wall ties shall be no less than 4 inches wide. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT. Adjustable type wall ties, if approved for use, shall consist of two essentially U-shaped elements fabricated of 3/16 inch diameter zinc-coated steel wire. Adjustable ties shall be of the double pintle to eye type and shall allow a maximum of 1/2 inch eccentricity between each element of the tie. Play between pintle and eye opening shall be not more than 1/16 inch. The pintle and eye elements shall be formed so that both can be in the same plane.

2.7.2 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

2.8 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to ASTM A 82, welded construction. Tack welding will not be acceptable in

reinforcement used for wall ties. Wire shall have zinc coating conforming to ASTM A 153/A 153M, Class B-2. All wires shall be a minimum of 9 gauge. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of 5/8 inch cover from either face. The distance between crosswires shall not exceed 16 inches. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Joint reinforcement shall be provided with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features.

2.9 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A 615/A 615M, Grade 60.

2.10 FLASHING

Flashing shall be as specified in Section 07600 SHEET METALWORK, GENERAL.

2.11 WEEP HOLE VENTILATORS

Weephole ventilators shall be prefabricated aluminum grill type vents designed to prevent insect entry with maximum air entry. Ventilators shall be sized to match modular construction with a standard 3/8 inch mortar joint.

PART 3 EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

3.1.1 Hot Weather Installation

The following precautions shall be taken if masonry is erected when the ambient air temperature is more than 99 degrees F in the shade and the relative humidity is less than 50 percent. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 4 feet ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

3.1.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below 40 degrees F, a written statement of proposed cold weather construction procedures shall be submitted for approval. The following precautions shall be taken during all cold weather erection.

3.1.2.1 Preparation

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

- a. Air Temperature 40 to 32 Degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F.
- b. Air Temperature 32 to 25 Degrees F. Sand and mixing water shall be

heated to produce mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing.

- c. Air Temperature 25 to 20 Degrees F. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.
- d. Air Temperature 20 Degrees F and below. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

3.1.2.2 Completed Masonry and Masonry Not Being Worked On

- a. Mean daily air temperature 40 to 32 degrees F. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
- b. Mean daily air temperature 32 to 25 degrees F. Masonry shall be completely covered with weather-resistant membrane for 24 hours.
- c. Mean Daily Air Temperature 25 to 20 degrees F. Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.
- d. Mean Daily Temperature 20 degrees F and Below. Masonry temperature shall be maintained above 32 degrees F for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

3.2 LAYING MASONRY UNITS

Masonry units shall be laid in running bond pattern. Facing courses shall be level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances shall be plus or minus 1/2 inch. Each unit shall be adjusted to its final position while mortar is still soft and plastic. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below. In double wythe construction, the inner wythe may be brought up not more than 16 inches ahead of the outer wythe. Collar joints shall be filled with mortar or grout during the laying of the facing wythe, and filling shall

not lag the laying of the facing wythe by more than 8 inches.

3.2.1 Surface Preparation

Surfaces upon which masonry is placed shall be cleaned of laitance, dust, dirt, oil, organic matter, or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least 1/8 inch. Sandblasting shall be used, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.2 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved. Double walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

3.2.3 Clay or Shale Brick Units

Brick facing shall be laid with the better face exposed. Brick shall be laid in running bond with each course bonded at corners, unless otherwise indicated. Molded brick shall be laid with the frog side down. Brick that is cored, recessed, or has other deformations may be used in sills, treads, soldier courses, except where deformations will be exposed to view.

3.2.3.1 Wetting of Units

Wetting of clay, shale brick, or hollow brick units having an initial rate of absorption of more than 1 gram per minute per square inch of bed surface shall be in conformance with ASTM C 67. The method of wetting shall ensure that each unit is nearly saturated but surface dry when laid.

3.2.3.2 Solid Units

Bed, head, and collar joints shall be completely filled with mortar.

3.2.3.3 Hollow Units

Hollow units shall be laid as specified for concrete masonry units.

3.2.4 Tolerances

Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

TABLE II
TOLERANCES

Variation from the plumb in the lines
and surfaces of columns, walls and arises

In adjacent masonry units	1/8 inch
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations from the plumb for external corners,
expansion joints, and other conspicuous lines

In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from the level for exposed lintels,
sills, parapets, horizontal grooves, and other
conspicuous lines

In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variation from level for bed joints and top
surfaces of bearing walls

In 10 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from horizontal lines

In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations in cross sectional dimensions of
columns and in thickness of walls

Minus	1/4 inch
Plus	1/2 inch

3.2.5 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will

completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

3.2.6 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

3.2.6.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unparged masonry walls below grade shall be pointed tight. Flush joints for architectural units, such as fluted units, shall completely fill both the head and bed joints.

3.2.6.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled and match existing. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3.2.7 Joint Widths

Joint widths shall be as follows:

3.2.7.1 Concrete Masonry Units

Concrete masonry units shall have 3/8 inch joints, except for prefaced concrete masonry units.

3.2.7.2 Brick

Brick joint widths shall be the difference between the actual and nominal dimensions of the brick in either height or length. Brick expansion joint widths shall be as shown.

3.2.8 Embedded Items

Spaces around built-in items shall be filled with mortar. Openings around flush-mount electrical outlet boxes in wet locations shall be pointed with mortar. Anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar. Cells receiving anchor bolts and cells of the first course below bearing plates shall be filled with grout.

3.2.9 Unfinished Work

Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Loose mortar shall be removed and the exposed joints shall be thoroughly cleaned before laying

new work.

3.2.10 Masonry Wall Intersections

Each course shall be masonry bonded at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

3.3 WEEP HOLES

Weep holes shall be provided not more than 24 inches on centers in mortar joints of the exterior wythe above wall flashing, over foundations, bond beams, and any other horizontal interruptions of the cavity. Weep holes shall be constructed using weep hole ventilators. Other approved methods may be used for providing weep holes. Weep holes shall be kept free of mortar and other obstructions.

3.4 MORTAR

Mortar shall be mixed in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measurement of ingredients for mortar shall be by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Water shall be mixed with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Mortar that has stiffened because of loss of water through evaporation shall be retempered by adding water to restore the proper consistency and workability. Mortar that has reached its initial set or that has not been used within 2-1/2 hours after mixing shall be discarded.

3.5 REINFORCING STEEL

Reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 2 inches of tops of walls.

3.5.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

3.5.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

3.6 JOINT REINFORCEMENT

Joint reinforcement shall be installed at 16 inches on center or as indicated. Reinforcement shall be lapped not less than 6 inches. Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 5/8 inch cover to either face of the unit.

3.7 PLACING GROUT

Cells containing reinforcing bars shall be filled with grout. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

3.8 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 1/2 inch shall be maintained between reinforcement and interior faces of units.

3.9 SHELF ANGLES

Shelf angles shall be adjusted as required to keep the masonry level and at the proper elevation. Shelf angles shall be galvanized. Shelf angles shall be provided in sections not longer than 10 feet and installed with a 1/4 inch gap between sections. Shelf angles shall be mitered and welded at building corners with each angle not shorter than 4 feet, unless limited by wall configuration.

3.10 LINTELS

3.10.1 Masonry Lintels

Masonry lintels shall be constructed with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 1/2 inch above the bottom inside surface of the lintel unit.

3.11 SILLS AND COPINGS

Sills and copings shall be set in a full bed of mortar with faces plumb and true.

3.12 ANCHORAGE TO CONCRETE AND STRUCTURAL STEEL

3.12.1 Anchorage to Concrete

Anchorage of masonry to the face of concrete columns, beams, or walls shall be with dovetail anchors spaced not over 16 inches on centers vertically and 24 inches on center horizontally.

3.12.2 Anchorage to Structural Steel

Masonry shall be anchored to vertical structural steel framing with adjustable steel wire anchors spaced not over 16 inches on centers vertically, and if applicable, not over 24 inches on centers horizontally.

3.13 PARGING

The outside face of below-grade exterior concrete-masonry unit walls enclosing usable rooms and spaces, except crawl spaces, shall be parged with type S mortar. Parging shall not be less than 1/2 inch thick troweled to a smooth dense surface so as to provide a continuous unbroken shield from top of footings to a line 6 inches below adjacent finish grade, unless otherwise indicated. Parging shall be coved at junction of wall and footing. Parging shall be damp-cured for 48 hours or more before backfilling. Parging shall be protected from freezing temperatures until hardened.

3.14 SPLASH BLOCKS

Splash blocks shall be located as shown.

3.15 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, mortar and grout daubs or splashings shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high pressure stream of water and a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.15.1 Concrete Masonry Unit and Concrete Brick Surfaces

Exposed concrete masonry unit and concrete brick surfaces shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.15.2 Clay or Shale Brick Surfaces

Exposed clay or shale brick masonry surfaces shall be cleaned as necessary to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. After cleaning, the sample panel of similar material shall be examined for

discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, the method of cleaning shall be changed to assure that the masonry surfaces in the structure will not be adversely affected. The exposed masonry surfaces shall be water-soaked and then cleaned with a solution proportioned 1/2 cup trisodium phosphate and 1/2 cup laundry detergent to one gallon of water or cleaned with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay products manufacturer. The solution shall be applied with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturer's printed recommendations. Efflorescence shall be removed in conformance with the brick manufacturer's recommendations.

3.16 PROTECTION

Facing materials shall be protected against staining. Top of walls shall be covered with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 2 feet down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

-- End of Section --

SECTION 04900

RESTORATION AND CLEANING OF MASONRY IN HISTORIC STRUCTURES
05/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI Compilation 20 (1993) Repair and Rehabilitation II

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH Limit Values (1999) Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 109/C 109M (1999) Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)

ASTM C 150 (1999a) Portland Cement

ASTM C 207 (1991; R 1997) Hydrated Lime for Masonry Purposes

ASTM C 920 (1998) Elastomeric Joint Sealants

ASTM C 1324 (1996) Examination and Analysis of Hardened Masonry Mortar

ASTM D 3399 (1981; R 1992el) General-Purpose Synthetic Detergent Liquid

BRICK INSTITUTE OF AMERICA (BIA)

BIA Tech Note 20 Rev II (1990) Cleaning Brick Masonry

1.2 GENERAL REQUIREMENTS

Work shall be done in conformance with ACI Compilation 20. Non-historic masonry work, including materials, procedures, and requirements shall conform to Section 04200A MASONRY, except as otherwise specified herein.

1.2.1 Cleaning and Restoration Methods

The cleaning and restoration methods, and materials selected for a specific structure, shall be submitted for approval before work starts, and shall take into account the total construction system of the building to be worked upon, including different masonry and mortar materials, as well as non-masonry elements which may be affected by the work.

1.2.2 Ionic Cleaners

Ionic chemical cleaners shall be used as specified, in accordance with the manufacturer's instructions, and only upon the direction of the Contracting Officer. Ionic cleaners shall be used only after gentler cleaning methods have been determined to be ineffective through the use of test panels.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cleaning and Restoration Methods; G.

Descriptive narrative in cleaning and repair methods to be employed in the work. Description shall be organized in sequence from preparation through completion of the work. Schedule showing estimated time, in calendar days, for completion of each phase of the work shall be included.

Qualifications

Documentation showing Contractor's experience of 5 consecutive years in masonry restoration, plus a list of similar jobs to the one specified herein.

SD-07 Certificates

Materials

Certificates of compliance attesting that the materials, equipment, and cleaning agents (chemicals, detergents, etc.) to be used in the work meet the specified requirements.

1.4 QUALIFICATIONS

The Contractor shall provide qualified workers, trained and experienced in restoration of masonry in historic structures, and shall furnish documentation of 5 consecutive years of work of this type. A list of similar jobs shall be provided identifying when, where, and for whom the work was done.

1.5 EQUIPMENT AND TECHNIQUES DEMONSTRATION

Equipment and techniques of operation shall be demonstrated in an approved location and shall be subject to approval. Dependable and sufficient equipment, appropriate and adequate to accomplish the work specified, shall be assembled at the work site in sufficient lead time before the start of

the work to permit inspection, calibration of weighing and measuring devices, adjustment of parts, and the making of any repairs that may be required. The equipment shall be maintained in good working condition throughout the project.

1.5.1 Cleaning Equipment

Cleaning equipment shall not cause staining, erosion, marring, or other damage or changes in the appearance of the surfaces to be cleaned.

1.5.1.1 Sandblasting

Sandblasting equipment will not be allowed for cleaning masonry surfaces.

1.5.1.2 Water Blasting

Water blasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water re-supply equipment. The equipment shall not be operated at a pressure which will cause etching or other damage to the masonry surface or mortar joints. The equipment shall be operated at a discharge capacity of 55 to 500 psi and 2.5 to 3 gpm for general surface cleaning operations. The water tank and auxiliary re-supply equipment shall be of sufficient capacity to permit continuous operations. The Contractor shall provide protective covers and barriers as required to prevent over-spray onto adjacent surfaces.

1.5.2 Finishing and Texturing Equipment

Equipment and hand tools used for placing, finishing and texturing masonry and mortar shall be commercially available and commonly used in masonry construction and repair. Surface grinders, impact tools, and other equipment shall conform to the specified requirements, except as specifically required by the type of finish and texture.

1.5.3 Compressed Air Supplies

Compressed air equipment shall deliver clean, oil and moisture free compressed air at the surface to be cleaned. The compressed air line shall have at least two in-line air filters to remove oil and moisture from the air supply. The compressed air supply shall be tested during each shift for the presence of oil and moisture.

1.5.4 Material Handling and Associated Equipment

1.5.4.1 Mixing, Transporting, and Placing Job Materials

Equipment used for mixing, transporting, placing, and confining masonry and mortar placements shall be capable of satisfactorily mixing material and supporting placement operations in an uninterrupted manner. Defects and deficiencies in operation or capacity shall be resolved prior to use in the work. Equipment used for mixing, conveying, and placing of materials shall be clean, free of old materials and contaminants, and shall conform to the material manufacturer's recommendations.

1.5.4.2 Associated Equipment

Associated equipment such as mixer timing equipment, valves, pressure gauges, pressure hoses, other hardware, and tools shall be provided as

required to ensure a continuous supply of material and operation control.

1.6 SAMPLE MASONRY PANELS

Sample panels of each procedure proposed for use in the work shall be submitted for approval. No masonry or mortar shall be used in the work until the samples and the represented mixture have been approved.

1.7 MATERIAL REQUIREMENTS

1.7.1 Strength

Each class or mixture of mortar shall have a 28-day compressive strength matching the compressive strength of the original existing mortar in the structure as determined by ASTM C 109/C 109M for mortar. Test specimens of existing mortar shall be taken from a sound and intact representative portion of the structure, at locations indicated.

1.7.2 Special Properties

Mortar may contain admixtures, such as pigments, to match the characteristics of the original mortar. Use of all admixtures shall be subject to approval.

1.7.3 Cementitious Content of Mortar

Each class or mixture of mortar shall have a cement content matching the cement content of the original existing mortar in order to provide uniform strength, weathering characteristics, and appearance of repaired surfaces in relation to existing surfaces.

1.7.4 Sand

The sand used in mortar shall match the sand in the existing mortar.

1.8 STORAGE OF MATERIALS

Materials shall be stored in weathertight structures which will exclude moisture and contaminants. Cement shall be furnished in suitable bags used for packaging cements. Labeling of packages shall clearly define contents, manufacturer, and batch identification. Detergents, masonry cleaners, paint removers, solvents, epoxies and other chemicals used for masonry cleaning shall be in sealed containers that legibly show the designated name, formula or specification number, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Accessories shall be stored avoiding contamination and deterioration. Admixtures which have been in storage onsite for six months or longer, or which have been subjected to freezing, shall not be used unless retested and proven to meet the specified requirements.

1.9 SAFETY AND HEALTH

Work shall comply with applicable federal, state, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis, specified in the CONTRACT CLAUSES. The Activity Hazard Analysis shall include analyses of the potential impact of cleaning operations on personnel and on others involved in and adjacent to the work zone.

1.9.1 Worker Exposures

Exposure of workers to chemical substances shall not exceed the limits established by ACGIH Limit Values, or those required by a more stringent applicable regulation.

1.9.2 Training

Workers having access to an affected work area shall be informed of the contents of the applicable material safety data sheets, of potential health and safety hazard, and of protective controls associated with materials used on the project. An affected work area is one which may receive dust, mists, and odors from the surface preparation operations. Workers involved in masonry cleaning shall be trained in the safe handling and application, and the exposure limit, of each material to be used in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

1.9.3 Coordination

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from surface preparation, cleaning, and repair operations.

1.10 PROTECTION

Persons, motor vehicles, adjacent surfaces, surrounding buildings, equipment, and landscape materials shall be protected from chemicals used and runoff from cleaning and paint removal operations. Temporary protection covers, which shall remain in operation during the course of the work, shall be erected over pedestrian walkways and at personnel and vehicular points of entrance and exit.

1.10.1 Interior Protection

The interior of buildings shall be protected from the weather, cleaning, and repair operations at all times.

1.10.2 Environmental Protection

The work shall comply with the requirements of Sections 01355 ENVIRONMENTAL PROTECTION and 13283 REMOVAL AND DISPOSAL OF LEAD-CONTAINING PAINT.

1.11 WEATHER LIMITATIONS

Masonry, mortar, and epoxy adhesives shall not be placed when weather conditions detrimentally affect the quality of the finished product. No masonry or mortar shall be placed when the air temperature is below 40 degrees F in the shade. When air temperature is likely to exceed 90 degrees F masonry and mortar shall have a temperature not exceeding 90 degrees F when deposited. Materials to be used in the work shall be neither produced nor placed during periods of rain or other precipitation. Material placements shall be stopped, and all in-place material shall be protected from exposure, during periods of rain or other precipitation.

1.12 WARRANTIES

1.12.1 Cleaning Warranty

Cleaning procedures shall be warranted for a period of two years against harm to substrate (masonry and mortar) or to adjacent materials including, but not limited to, discoloration of substrate from improper procedures or usage, chemical damage from inadequate rinse procedures, and abrasive damage from improper procedures.

1.12.2 Repair Warranty

Repair procedures, including repointing, shall be warranted for a period of two years against: discoloration or mismatch of new mortar to adjacent original historic mortar, discoloration or damage to masonry from improper mortar clean-up, loss of bond between masonry and mortar, fracturing of masonry edges from improper mortar joint preparation procedures or improper mortar formulation, and occurrence of efflorescence.

1.13 SCOPE OF WORK

The scope of work includes cleaning brick surfaces and repointing mortar joints as follows:

- a. Clean all brick surfaces. At the beginning of construction, a joint inspection of the existing mortar joints shall be conducted by the Contracting Officer and the Contractor to determine, verify and confirm the condition of the existing mortar joints to be repointed.
- b. Repoint mortar joints where indicated (quantities are indicated; locations shall be as directed by the Contracting Officer).
- c. Repairs shall match adjacent surfaces to remain. Provide field samples as required for approval prior to commencing work.

1.14 Existing Silicone Sealant

Numerous applications of silicone sealant conforming to ASTM C 920 have been applied to the existing brick and mortar joints on the General Officers' Quarters and the Enlisted Quarters. The Contractor shall take the appropriate measures, as described herein, to remove existing silicone sealant from the buildings.

PART 2 PRODUCTS

2.1 MATERIALS

Materials, physical and chemical properties, and composition of masonry and mortar used in renovation work shall match that of original existing masonry and mortar to be repaired, unless samples and testing determine that existing mixtures and materials are faulty or non-performing.

2.2 CLEANING MATERIALS

2.2.1 Paint Removers

Chemical paint removers shall be manufacturer's water soluble, low toxicity products, effective for removal of paint on masonry without altering, damaging, or discoloring the masonry surface.

2.2.2 Detergent Cleaners

Detergent cleaners shall be in accordance with ASTM D 3399.

2.2.3 Ionic Cleaners

2.2.3.1 Alkaline Prewash Cleaner

Alkaline prewash cleaners shall be as recommended by the manufacturer.

2.2.3.2 One-Part Masonry Cleaner

One-part masonry cleaners shall be the standard, acid formulation recommended by the manufacturer.

2.2.3.3 Two-Part Limestone Cleaner

Two-part limestone cleaners shall be manufacturer's standard, two-part masonry cleaning system consisting of an alkaline prewash cleaner followed by acidic afterwash rinse.

2.2.3.4 Standard Strength Acidic Cleaner

Acidic cleaners shall be manufacturer's standard strength, acidic masonry restoration cleaner composed of hydrofluoric acid blended with other acids and combined with special wetting systems and inhibitors.

2.2.3.5 Extra Strength Acidic Cleaner

Masonry restoration extra strength acidic cleaners shall be as recommended by the manufacturer.

2.2.4 Liquid Strippable Masking Agent

Liquid strippable masking agent shall be manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from the damaging effect of acidic and alkaline masonry cleaners.

2.2.5 Spray Equipment

Spray equipment for chemical cleaners shall be low-pressure tanks or chemical pumps suitable for chemical cleaner indicated, and shall be equipped with stainless steel, cone-shaped spray-tip. Spray equipment for water shall disperse water through a fan-shaped spray tip at an angle of not less than 15 degrees. Spray equipment shall deliver water at a pressure not greater than 500 psi and at a volume between 2.5 and 3 gpm. Spray equipment for heated water shall be capable of maintaining temperature, at flow rates indicated, between 140 and 180 degrees F.

2.2.6 Cleaning Implements

Brushes shall have natural or nylon fiber bristles only. Wire brushes shall not be used. Scrapers and application paddles shall be made of wood with rounded edges. Metallic tools shall not be used.

2.2.7 Water

Potable water shall be obtained from a local source and shall be filtered to remove minerals resulting in a neutral pH, prior to application.

Backflow prevention devices shall be provided at the point of connection to the water supply.

2.3 REPAIR MATERIALS

2.3.1 Masonry and Mortar

Masonry and mortar materials used for repair and renovation shall match the original existing historic materials as closely as possible in composition, color, texture, strength, size, finishing and porosity.

2.3.2 Cementitious Materials

Cementitious materials shall be of one type and from one source, when used in mortar which will have surfaces exposed in the finished structure. Cement composition shall match that of cement used in existing mortar to be repaired, as determined by samples and testing, and shall conform to the basic requirements of ASTM C 150, low alkali type.

2.3.3 Lime

Line shall comply with ASTM C 207, Type S.

2.3.4 Masonry Cement

Masonry cement shall not be provided.

PART 3 EXECUTION

3.1 EVALUATION AND ANALYSIS

Evaluation and analysis shall conform to the requirements specified herein, and to Section 01451 CONTRACTOR QUALITY CONTROL. Masonry renovation shall be undertaken only after complete evaluation and analysis of the areas to be repaired are completed; this shall include sampling and testing of the existing mortar to determine its composition and qualities. No repair work shall be undertaken until conditions that have caused masonry deterioration have been identified; such conditions shall be corrected, if possible, prior to start of the work.

3.2 MASONRY CLEANING

Historic materials shall not be damaged or marred in the process of cleaning. Cleaning shall conform to BIA Tech Note 20 Rev II. Open joints shall be temporarily caulked or otherwise protected to prevent water and cleaner intrusion into the interior of the structure from pressure spraying. Non-masonry materials and severely deteriorated masonry shall be protected by approved methods prior to initiation of cleaning operations. Masonry cleaning shall remove all organic and inorganic contaminants from the surface and pores of the substrate, returning the masonry to its natural color. Surfaces shall be evenly cleaned with no evidence of streaking or bleaching. The cleaning process shall not affect the density, porosity, or color of the masonry or mortar. Cleaned masonry shall have a neutral pH. Methods used for cleaning historic masonry shall be the gentlest possible to achieve the desired results. Test patches shall be made to determine a satisfactory cleaning result. Cleaning shall proceed in an orderly manner, working from top to bottom of each scaffold width and from one end of each elevation to the other. Cleaning shall be performed in a manner which results in uniform coverage of all surfaces, including

corners, moldings, interstices and which produces an even effect without streaking or damage to masonry. The cleaning materials, equipment, and methods shall not result in staining, erosion, marring, or other damage to the surfaces of the structure. Following an initial inspection and evaluation of the structure and surfaces, the structure shall be given a surface cleaning. The surface cleaning shall be completed prior to start of repair work, and sampling and testing of mortars. The cleaning shall provide for the complete cleaning of all exterior masonry surfaces of the structures, removing all traces of moss, dirt, and other contaminants. The cleaning shall provide a clean masonry surface to allow determination of the masonry's color and shades, finish and texture, and other properties. Following completion of the surface cleaning of the structure (or side of structure) the masonry shall be dried prior to the start of any repair work. The following sequence of methods shall be used to determine the least aggressive, effective cleaning method:

1. Water with brushes.
2. Water with mild soap.
3. Water with stronger soap.
4. Water with stronger soap plus ammonia.
5. Water with stronger soap plus vinegar (not to be used on calcareous masonry).
6. Stronger chemical cleaners, to be used only if any of the above methods is determined to be ineffective by the Contracting Officer.

3.2.1 Project Conditions

Masonry surfaces shall be cleaned only when air temperatures are above 40 degrees F and will remain so until masonry has dried out, but for not less than 7 days after completion of the work.

3.2.2 Chemical Cleaners

Acidic chemical cleaners shall not be used on limestone, marble, concrete and other calcareous (calcium containing) masonry materials. If chemical cleaners are used on such materials, they shall be alkaline based and utilized with neutralizing afterwashes.

3.2.3 Test Patches

The materials, equipment, and methods to be used in cleaning shall be demonstrated in a test section approximately 3 by 3 ft square. The location of the test section, and the completed test section shall be subject to approval. The cleaning process shall be adjusted as required and the test section rerun until an acceptable process is obtained. Test patches shall be located in inconspicuous areas of the building. The areas tested shall exhibit soiling characteristics representative of those larger areas to be cleaned. Tests shall also be conducted on areas to be stripped of paint. Tested areas shall be allowed to dry before a determination is made on the effectiveness of a particular treatment.

3.2.4 Water Cleaning

3.2.4.1 Pressure Spraying

Water shall be spray applied to masonry surfaces to comply with requirements indicated by test patches for location, purpose, water temperature, pressure, volume, and equipment. Unless otherwise indicated, the surface washing shall be done with clean, low pressure water (pressure

of less than 55 psi and 2.5 to 3 gpm discharge) and the spray nozzle shall not be held less than 12 inches from surface of masonry. Water shall be applied side to side in overlapping bands to produce uniform coverage.

3.2.4.2 Handscrubbing

Pre-wetted surfaces shall be scrubbed using hand-held natural bristle or nylon brushes. Wire brushes shall not be used. Surfaces to be cleaned shall be scrubbed to remove surface contaminants.

3.2.4.3 Rinsing

Scrubbed surfaces shall be rinsed clean of all contaminants and cleaning solutions with water in a low-to-moderate pressure spray, working upwards from bottom to top of each treated area. The rinsing cycle shall remove all traces of contaminants and cleaning solutions.

3.2.5 Chemical Cleaning

Chemical cleaning of historic masonry shall use the gentlest means possible to achieve the desired result as determined by test patches. Chemical cleaning shall be the use of any product in addition to water, including detergents, ammonia, vinegar, and bleach. Cleaning shall proceed in an orderly manner, working from top to bottom of each scaffold width and from one end of each elevation to the other. Cleaning shall result in uniform coverage of all surfaces, including corners, moldings, interstices and shall produce an even effect without streaking or damage to masonry. Chemical cleaners shall not be applied to the same masonry surfaces more than twice.

3.2.5.1 Surface Prewetting

Masonry surfaces to be cleaned with chemical cleaners shall be wetted with water using a low pressure spray before application of any cleaner.

3.2.5.2 Acidic Chemical Cleaning

Acidic chemical cleaners shall be applied according to manufacturer's instructions. Acidic chemical cleaners shall not be applied to masonry with high calcium content (e.g. marble, limestone). Acidic cleaners shall be applied to masonry surfaces by low pressure spray 50 psi max., roller, or brush. Cleaner shall remain on masonry surface for the time period recommended by manufacturer. Manual scrubbing by brushes shall be employed as indicated by test patches for the specific location. Cleaned surfaces shall be rinsed with a low-to-moderate pressure spray of water to remove all traces of chemical cleaner.

3.2.5.3 Alkaline Chemical Cleaning - Prewash Phase

Alkaline chemical cleaners shall be applied according to manufacturer's instructions. Alkaline cleaners shall be applied to masonry surfaces by low pressure spray 50 psi max., roller, or brush. Cleaner shall remain on masonry surface for the time period recommended by the manufacturer. Manual scrubbing by brushes shall be employed as indicated by test patches for the specific location. Cleaned surfaces shall be rinsed with a low-to-moderate pressure spray of water.

3.2.5.4 Alkaline Chemical Cleaning - Afterwash Phase

Immediately after rinsing of alkaline cleaned surfaces, a neutralizing afterwash shall be applied to the cleaned masonry areas. Neutralizing afterwash shall be applied according to manufacturer's instructions. Neutralizing afterwash shall be applied to masonry surfaces by low pressure spray 50 psi max., roller, or brush. Afterwash shall remain on masonry surface for the time period recommended by manufacturer. Cleaned surfaces shall be rinsed with a low-to-moderate pressure spray of water to remove all traces of chemical cleaners.

3.2.5.5 pH Testing

Masonry surfaces which have been chemically cleaned shall be pH tested using pH monitoring pencils or papers. Chemically cleaned masonry shall be rinsed of all chemical residues until a neutral pH (7) reading is obtained from the masonry surface.

3.3 MASONRY REPAIR (REPOINTING MORTAR JOINTS)

Repaired surfaces shall match adjacent existing surfaces in all respects. Masonry repair shall proceed only after the cause of deterioration has been identified and corrected. Masonry repair shall conform to ACI Compilation 20. Masonry repair shall proceed only after the area to be repaired has been cleaned. The materials, methods and equipment proposed for use in the repair work shall be demonstrated in test panels. The location, number, size and completed test panels shall be subject to approval. Products shall be used in accordance with the manufacturer's instructions.

3.3.1 Repointing

Repointing work shall be as indicated and as specified. Old caulking, grout, or mortar shall be removed from previously repaired cracks where it is failing. Loose particles shall be removed from cracks. Cracks shall be cleaned, rinsed with water followed by blowing with filtered, dry, compressed air.

3.3.1.1 Mortar Analysis

Existing original historic mortar shall be analyzed before repointing in order to provide a match with the new repointing mortar. Tests of existing mortar from similar units previously renovated are available for viewing for informational purposes at the COE Field Office, 752 Durand Road, Langley AFB, VA. Lime for repointing mortar shall conform to ASTM C 207, Type S, unless otherwise specified. Full laboratory analysis of the existing mortar shall conform to ASTM C 1324. Field analysis of the existing mortar shall be as specified below.

3.3.1.2 Taking and Preparation of Samples

Samples of unweathered original historic mortar shall be taken and analyzed in order to match the new mortar to be used for repointing. Samples of each different type of mortar in the structure shall be taken and analyzed.

Three or four samples of each type of mortar to be matched shall be removed with a hand chisel from several locations on the building. The largest sample shall be set aside for comparison with the repointing mortar. The remaining samples shall be broken apart with a wooden mallet, powdering them into their constituent parts.

3.3.1.3 Binder Analysis

A part of the sample shall be stirred into diluted hydrochloric acid. If a vigorous chemical reaction (bubbling) occurs and most of the binder disappears, leaving clean aggregate, the binder was lime. A portland cement binder will result in a murky liquid and will dissolve very slowly over several days.

3.3.1.4 Aggregate Analysis

Aggregate of the mortar sample shall be separated from the binder. This shall be accomplished by taking the crushed mortar sample and either gently blowing away the fine binder material, placing the crushed sample in a centrifuge, or chemically separating the aggregate from the binder. The separated aggregate shall be rinsed clean with water and dried. The aggregate shall be examined with a magnifying glass, and the component materials shall be recorded as to range of materials, sizes, colors, as well as the presence of other materials.

3.3.2 Mechanical Repair

Original historic masonry materials shall be repaired or replaced only if surfaces are extensively deteriorated (surface missing to a depth of 4 inches or more) or are threatening the safety of the structure or individuals. Deteriorated surfaces shall be removed and repaired or replaced only upon approval. Repairs and replacements shall match the materials, colors, and finish of the existing historic masonry as closely as possible.

3.3.2.1 Areas To Be Removed

Unsound, weak, or damaged masonry and mortar shall be removed in areas as indicated. Loose particles, laitance, spalling, cracked, or debonded masonry and mortar and foreign materials shall be removed with hand tools unless otherwise noted. Surfaces prepared for repair shall be cleaned free of dust, dirt, masonry chips, oil or other contaminants, rinsed with water, and dried before repair work is begun. Surfaces of the structure, and surfaces adjacent to the work area shall be protected from damage which may result from removal, cleaning, and repair operations.

3.3.2.2 Application of Masonry and Mortar

Masonry and mortar shall be placed to rebuild spalled or damaged areas to match the original surface finish, level, texture, and color. The finished appearance of the patch shall match the adjacent existing surface.

3.4 MORTAR FINISHES AND COLOR

The exposed surfaces of mortar repair shall match the finish, color, texture, and surface detail of the original surface. Mechanical finishing and texturing may be required to produce the required finish and appearance. The finishing and texturing shall conceal bond lines between the repaired area and adjacent surfaces. The texturing shall provide replication of all surface details, including tooling and machine marks. The equipment used in finishing and texturing shall be a low-impact energy type which will not weaken the patch or damage the patch bond and the adjacent concrete.

3.5 JOINT SEALING

Joint sealing shall be as specified in Section 07900A JOINT SEALING.

3.6 FINAL CLEANING

No sooner than 72 hours after completion of the repair work and after joints are sealed, faces and other exposed surfaces of masonry shall be washed down with water applied with a soft bristle brush, then rinsed with clean water. Discolorations which cannot be removed by these procedures, shall be considered defective work. Cleaning work shall be done when temperature and humidity conditions allow the surfaces to dry rapidly. Adjacent surfaces shall be protected from damage during cleaning operations.

3.7 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations.

3.8 DEFECTIVE WORK

Defective work shall be repaired or replaced, as directed, using approved procedures.

3.9 FINAL INSPECTION

Following completion of the work, the structure shall be inspected for damage, staining, and other distresses. The patches shall be inspected for cracking, crazing, delamination, unsoundness, staining and other defects. The finish, texture, color and shade, and surface tolerances of the patches shall be inspected to verify that all requirements have been met. Surfaces exhibiting defects shall be repaired as directed.

-- End of Section --

SECTION 05500A

MISCELLANEOUS METAL
01/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(2001) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 53/A 53M	(2001) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 653/A 653M	(2000) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924/A 924M	(1999) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(2000) Structural Welding Code - Steel
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NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531	(1994) Metal Bar Grating Manual
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Samples

Miscellaneous Metal Items

Samples of the following items: Foundation vents. Samples shall be full size, taken from manufacturer's stock, and shall be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

1.7 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

PART 2 PRODUCTS

2.1 FLOOR GRATINGS AND FRAMES

Carbon steel and stainless steel grating shall be designed in accordance with NAAMM MBG 531 to meet the indicated load requirements. Edges shall be banded with bars 1/4 inch less in height than bearing bars for grating sizes above 3/4 inch. Banding bars shall be flush with the top of bearing grating. Frames shall be of welded steel construction finished to match the grating. Floor gratings and frames shall be galvanized after fabrication.

2.2 FLOOR PLATES

Floor plates shall be 1/4 inch thick, raised thread steel, galvanized.

2.3 FOUNDATION VENTS

Foundation vents shall be the same size as the masonry units or sized as indicated, and shall be of extruded aluminum with integral water stop and sliding interior closer or damper operable from the outside. Insect screen shall be provided at the back of the vent. Louvered opening shall have top and bottom drip lips, and the net ventilating area with closer or damper open shall be at least 35 percent of the gross wall opening. The frames shall have a structural strength adequate to permit use in masonry walls without a lintel.

2.4 HANDRAILS

Handrails shall be designed to resist a concentrated load of 200 pounds in any direction at any point of the top of the rail or 20 pounds per foot applied horizontally to top of the rail, whichever is more severe.

2.4.1 Steel Handrails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53/A 53M. Steel railings shall be 1-1/2 inch nominal size. Railings shall be hot-dip galvanized. Pipe collars shall be steel and hot-dip galvanized steel.

- a. Joint posts, rail, and corners shall be fabricated by one of the following methods:

- (1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8 inch hexagonal recessed-head setscrews.

- (2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.

- (3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

- b. Removable sections, toe-boards, and brackets shall be provided as indicated.

2.5 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous

mountings, and frames, shall be provided to complete the work.

2.6 SAFETY NOSING

Safety nosings shall be of cast aluminum with abrasive surface. Nosing shall be 3 inches wide and terminating at not more than 3 inches from the ends of treads. Safety nosings shall be provided with anchors not less than 3/4 inch long. Integrally cast mushroom anchors are not acceptable.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

3.2 ATTACHMENT OF HANDRAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

3.2.1 Installation of Steel Handrails

Rail ends shall be secured by steel pipe flanges anchored by expansion shields and bolts.

3.3 INSTALLATION OF SAFETY NOSINGS

Nosing shall be completely embedded in concrete before the initial set of the concrete occurs and shall finish flush with the top of the concrete surface.

-- End of Section --

SECTION 06100A

ROUGH CARPENTRY

02/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

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|-----------|---|
| AF&PA T01 | (1991; Supple 1993; Addenda Apr 1997; Supple T02) National Design Specification for Wood Construction |
| AF&PA T11 | (1988) Manual for Wood Frame Construction ** |

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

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|----------------|--|
| AITC 111 | (1979) Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection |
| AITC 190.1 | (1992) Wood Products - Structural Glued Laminated Timber |
| AITC TC Manual | (1994) Timber Construction Manual |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------|--|
| ASTM A 307 | (2000) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength |
| ASTM C 1136 | (1995) Flexible, Low Permeance Vapor Retarders for Thermal Insulation |
| ASTM C 1289 | (1998) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board |
| ASTM C 518 | (1998) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus |
| ASTM C 553 | (1999) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications |
| ASTM C 578 | (1995) Rigid, Cellular Polystyrene Thermal Insulation |
| ASTM C 591 | (1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation |

ASTM C 665	(1998) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM D 3498	(1999) Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
ASTM E 154	(1988; R 1999) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM E 96	(2000) Water Vapor Transmission of Materials
ASTM F 547	(1977; R 1995) Definitions of Terms Relating to Nails for Use with Wood and Wood-Based Materials

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C2	(2000) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA C9	(1997) Plywood - Preservative Treatment by Pressure Processes
AWPA M4	(1999) Standard for the Care of Preservative-Treated Wood Products
AWPA P5	(2000) Standards for Waterborne Preservatives

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA EWS R540C	(1996) Builder Tips Proper Storage and Handling of Glulam Beams
APA PRP-108	(1980; Rev Jan 1996) Performance Standards and Policies for Structural-Use Panels

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM LPD 1-49	(1995) Loss Prevention Data Sheet - Perimeter Flashing
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NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules	(1994) Rules for the Measurement & Inspection of Hardwood & Cypress
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NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(1997) Standard Grading Rules for Northeastern Lumber
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SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB Rules (1994; Supple 8 thru 11) Standard Grading
Rules for Southern Pine Lumber

TRUSS PLATE INSTITUTE (TPI)

TPI 1 (1995; Errata) National Design Standard for
Metal Plate-Connected Wood Truss
Construction and Commentary; and Appendix 1

TPI HIB (1991) Handling, Installing and Bracing of
Metal Plate Connected Wood Trusses

U.S. DEPARTMENT OF COMMERCE (DOC)

PS-1 (1995) Construction and Industrial Plywood

PS-2 (1993) Wood-Base Structural-Use Panels

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (1996; Supp. VII & VIII) Standard Grading
and Dressing Rules for Douglas Fir, Western
Hemlock, Western Red Cedar, White Fir,
Sitka Spruce Lumber

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA Grading Rules (1999) Western Lumber Grading Rules 95

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Structural Wood Members
Installation of Framing

Drawings of structural laminated members, fabricated wood trusses, engineered wood joists and rafters, and other fabricated structural members indicating materials, shop fabrication, and field erection details; including methods of fastening.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity. Laminated timber shall be handled and stored in accordance with AITC 111 or APA EWS R540C.

1.4 BID QUANTITY TO REPLACE DAMAGED, MISSING, OR DETERIORATED WOOD FRAMING MEMBERS

After the existing plaster is removed from existing wood framing members (studs, floor and ceiling joists, etc.), all such wood members shall be inspected to determine their condition. The inspection will be conducted jointly between the Contractor and the Contracting Officer. Any wood which is found to be cut, damaged, missing, deteriorated, or otherwise unacceptable shall be replaced with new wood members as directed by the Contracting Officer. The size of new wood members shall be similar to the size of existing wood members which are being replaced. Shoring of the remaining wood members shall be provided as required during the removal and replacement process. Bids shall be based on the removal of existing studs and joists and provision of new studs and joists for 5 percent of all studs, joists, headers, rafters, or other framing members in the entire project at no additional cost to the Government.

1.5 BID QUANTITY OF REPLACE DETERIORATED ROOF SHEATHING

After the existing slate roofing and asphalt shingle roofing are removed, the existing roof sheathing shall be inspected to determine its condition. This inspection will be conducted jointly between the Contractor and the Contracting Officer. Any sheathing which is found to be deteriorated shall be replaced with new sheathing as directed by the Contracting Officer. Bids shall be based on the removal of existing sheathing and the provision of new sheathing for five percent of the all existing sheathing on the roofs of all buildings at no additional cost to the Government.

1.6 CONFLICTS BETWEEN EXISTING WOOD FRAMING AND NEW MECHANICAL ITEMS (DUCTWORK, ETC.) ON ENLISTED QUARTERS

Components, including ductwork, of the new mechanical system shall be sized and located to minimize conflicts with existing wood framing members. Wherever conflicts are required and cannot be avoided, the existing framing members shall be modified as required to accommodate the components of the mechanical system at no additional cost to the Government. The size of new wood members shall be similar to the size of existing wood members which are being replaced or modified. All such modifications to the existing wood members shall be approved by the Contracting Officer. Temporary shoring of the remaining wood members shall be provided as required during the removal and replacement process.

PART 2 PRODUCTS

2.1 LUMBER AND SHEATHING

2.1.1 Grading and Marking

2.1.1.1 Lumber Products

Solid sawn and finger-jointed lumber shall bear an authorized gradestamp or grademark recognized by ALSC, or an ALSC recognized certification stamp, mark, or hammerbrand. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

2.1.1.2 Fabricated Structural Members

Wood trusses shall be fabricated in accordance with TPI 1. Laminated timbers shall be marked with a quality mark indicating conformance to AITC 190.1. Engineered wood joists and rafters shall be fabricated using an

approved quality control system to meet specified requirements.

2.1.1.3 Plywood and Other Sheathing Products

Materials shall bear the grademark or other identifying marks indicating grades of material and rules or standards under which produced, including requirements for qualifications and authority of the inspection organization. Except for plywood and wood structural panels, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be exposed to view shall not bear grademarks or other types of identifying marks.

2.1.2 Sizes

Lumber and material sizes shall conform to requirements of the rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Unless otherwise specified, sizes indicated are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

2.1.3 Treatment

Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil. Except as specified for all-heart material of the previously mentioned species, the following items shall be treated:

- a. Wood members in contact with or within 18 inches of soil.
- b. Wood members in contact with water.
- c. Wood members exposed to the weather and those used in roofing systems or as nailing strips or nailers over fiberboard or gypsum-board wall sheathing as a base for wood siding.
- d. Wood members set into concrete regardless of location, including flush-with-deck wood nailers for roofs.
- e. Wood members in contact with concrete that is in contact with soil or water or that is exposed to weather.

2.1.3.1 Lumber and Timbers

Lumber and timbers shall be treated in accordance with AWPA C2 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 0.25 pcf intended for above ground use.
- b. 0.40 pcf intended for ground contact and fresh water use.

2.1.3.2 Plywood

Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 0.25 pcf intended for above ground use.

- b. 0.40 pcf intended for ground contact and fresh water use.

2.1.4 Moisture Content

At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

- a. Treated and Untreated Lumber Except Roof Planking: 4 inches or less, nominal thickness, 19 percent maximum. 5 inches or more, nominal thickness, 23 percent maximum in a 3 inch perimeter of the timber cross-section.

- b. Roof Planking: 15 percent maximum.

- c. Materials Other Than Lumber: In accordance with standard under which product is produced.

2.1.5 Structural Wood Members

Species and grades shall be as listed in AF&PA T01. Joists, rafters including trussed type, decking, and headers shall have design values of 1200 psi in bending for repetitive member uses. Design of members and fastenings shall conform to AITC TC Manual. Other stress graded or dimensioned items such as blocking, carriages, and studs shall be standard or No. 2 grade except that studs may be Stud grade.

2.1.5.1 Trussed Rafters

The design shall be as indicated. Connections shall be made with light-metal plate-connectors. Light-metal-plate-connected wood trusses shall be designed and fabricated in conformance with TPI 1. When new plate configuration is proposed, load testing of trusses is required and shall conform to Appendix D of TPI 1.

2.1.6 Sheathing

Sheathing shall be fiberboard, gypsum board, plywood, wood structural panels, or wood for wall sheathing; and plywood, wood structural panels, or wood for roof sheathing.

2.1.6.1 Plywood

Plywood shall conform to PS-1, APA PRP-108 or PS-2, Grade C-D or sheathing grade with exterior glue. Sheathing for roof and walls without corner bracing of framing shall have a span rating of 16/0 or greater for supports 16 inches on center and a span rating of 24/0 or greater for supports 24 inches on center.

2.1.6.2 Wood

Species and grade shall be in accordance with TABLE I at the end of this section. Wall sheathing shall be 1 inch thick for supports 16 or 24 inches on center without corner bracing of framing provided sheathing is applied diagonally. Roof sheathing shall be 1 inch thick for supports 16 or 24 inches on center.

2.1.7 Subflooring

2.1.7.1 Plywood

Plywood shall conform to PS-1, APA PRP-108 or PS-2; Grade C-D or Sheathing grade with exterior glue for uses not otherwise specified; Grade C-D or sheathing grade with exterior glue for reception of underlayment or wood flooring; underlayment grade with exterior glue, or C-C (plugged) exterior grade for use as a combination subfloor-underlayment under resilient flooring. Minimum span rating for subflooring shall be 24/16 for supports 16 inches on center, and 48/24 for supports 24 inches on center. Minimum span rating for combination subfloor-underlayment shall be 16/0 for supports 16 inches on center and 24/0 for supports at 24 inches on center.

2.1.8 Underlayment

Underlayment shall conform to one of the following:

2.1.8.1 Plywood

Plywood shall conform to PS-1, underlayment grade with exterior glue, or C-C (Plugged) exterior grade 11/32 inch thick, 4 feet wide.

2.1.9 Miscellaneous Wood Members

2.1.9.1 Nonstress Graded Members

Members shall include bridging, corner bracing, furring, grounds, and nailing strips. Members shall be in accordance with TABLE I for the species used. Sizes shall be as follows unless otherwise shown:

<u>Member</u>	<u>Size (inch)</u>
Bridging	1 x 3 or 1 x 4 for use between members 2 x 12 and smaller; 2 x 4 for use between members larger than 2 x 12.
Corner bracing	1 x 4.
Furring	1 x 2.
Grounds	Plaster thickness by 1-1/2.
Nailing strips	1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock.

2.1.9.2 Sill Plates

Sill plates shall be standard or number 2 grade.

2.1.9.3 Blocking

Blocking shall be standard or number 2 grade.

2.1.9.4 Rough Bucks and Frames

Rough bucks and frames shall be straight standard or number 2 grade.

2.2 ACCESSORIES AND NAILS

Markings shall identify both the strength grade and the manufacturer. Accessories and nails shall conform to the following:

2.2.1 Anchor Bolts

ASTM A 307, size as indicated, complete with nuts and washers.

2.2.2 Bolts: Lag, Toggle, and Miscellaneous Bolts and Screws

Type, size, and finish best suited for intended use. Finish options include zinc compounds, cadmium, and aluminum paint impregnated finishes.

2.2.3 Clip Angles

Steel, 3/16 inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.2.4 Expansion Shields

Type and size best suited for intended use.

2.2.5 Joist Hangers

Steel or iron, zinc-coated, size to fit members where used, sufficient strength to develop the full strength of supported member, complete with any special nails required.

2.2.6 Metal Bridging

Optional to wood bridging; zinc-coated steel, size and design to provide rigidity equivalent to specified wood bridging.

2.2.7 Nails and Staples

ASTM F 547, size and type best suited for purpose; staples shall be as recommended by the manufacturer of the materials to be joined. For sheathing and subflooring, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be galvanized. Nailing shall be in accordance with the recommended nailing schedule contained in AF&PA T11. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AF&PA T01. Reasonable judgement backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

2.3 INSULATION

Thermal resistance of insulation shall be not less than the R-values shown.

R-values shall be determined at 75 degrees F in accordance with ASTM C 518.

Contractor shall comply with EPA requirements in conformance with Section 01670 RECYCLED / RECOVERED MATERIALS. Insulation shall be the standard product of a manufacturer and factory marked or identified with manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages. Materials containing more than

one percent asbestos will not be allowed.

2.3.1 Batt or Blanket

2.3.1.1 Glass Fiber Batts and Rolls

Glass fiber batts and rolls shall conform to ASTM C 665, Type I unfaced insulation, having a UL rating of 25 and a smoke developed rating of 150 or less when tested in accordance with ASTM E 84. Insulation shall have a 10 mil thick, white, puncture resistant woven-glass cloth with vinyl facing on one side. Width and length shall suit construction conditions.

2.3.1.2 Mineral Fiber Batt

Mineral fiber batt shall conform to ASTM C 665, Type I unfaced insulation.

2.3.1.3 Mineral Fiber Blanket

Mineral fiber blanket shall conform to ASTM C 553, Type I, Class 6. Blankets shall be sized to suit construction conditions, resilient type for use below and above ambient temperature to 350 degrees F. Blankets shall have a factory applied vapor-barrier facing on one side with 2 inch nailing tabs on both edges. Vapor barriers shall be fire retardant, high vapor transmission, and aluminum foil laminated to crepe paper type conforming to ASTM C 1136, Type II. Nominal density shall be 0.75 pcf.

2.3.2 Sill Sealer

Mineral wool, 1 inch thick and compressible to 1/32 inch, width of sill, designed to perform as an air, dirt, and insect seal in conformance with ASTM C 665, Type I.

2.3.3 Rigid Insulation

2.3.3.1 Polystyrene Board

Polystyrene board shall be extruded and conform to ASTM C 578, Type IV.

2.3.3.2 Polyurethane or Polyisocyanurate Board

Unfaced preformed polyurethane shall conform to ASTM C 591. Faced polyisocyanurate shall conform to ASTM C 1289.

2.4 VAPOR RETARDER

Vapor retarder shall be polyethylene sheeting conforming to ASTM E 154 or other equivalent material. Vapor retarder shall have a maximum vapor permeance rating of 0.5 perms as determined in accordance with ASTM E 96, unless otherwise specified.

PART 3 EXECUTION

3.1 INSTALLATION OF FRAMING

3.1.1 General

General framing shall be in accordance with AF&PA T11. Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Members shall be framed for passage of ducts. Members

shall be cut, notched, or bored in accordance with applicable requirements of AF&PA T01 for the passage of pipes, wires, or conduits. Rafters, purlins, and joists shall be set with crown edge up. Framing shall be kept at least 2 inches away from chimneys and 4 inches away from fireplace backwalls. When joists, beams, and girders are placed on masonry or concrete, a wood base plate shall be positioned and leveled with grout. The joist, beam, or girder shall then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket shall be formed into the wall. The joist, beam, or girder shall then be placed into the pocket and leveled with a steel shim.

3.1.2 Structural Members

Members shall be adequately braced before erection. Members shall be aligned and all connections completed before removal of bracing. Individually wrapped members shall be unwrapped only after adequate protection by a roof or other cover has been provided. Scratches and abrasions of factory-applied sealer shall be treated with two brush coats of the same sealer used at the factory.

3.1.3 Partition and Wall Framing

Unless otherwise shown, studs shall be spaced 16 inches on centers. Studs shall be doubled at openings. Unless otherwise indicated, headers for openings shall be made of two pieces of stud material set on edge or solid lumber of equivalent size, and corners shall be constructed of not less than three full members. End studs of partitions abutting concrete or masonry shall be anchored thereto with expansion bolts, one near each end of each stud and at intermediate intervals of not more than 4 feet. Plates of partitions resting on concrete floors shall be anchored in place with expansion bolts, one near each end of each piece and at intermediate intervals of not more than 6 feet between bolts. In lieu of expansion bolts, anchoring into concrete may be accomplished with powder-driven threaded studs of suitable type and size and spaced at 3 feet on center. Walls and load bearing partitions shall be provided with double top plates with members lapped at least 4 feet and well spiked together.

3.1.4 Floor (Ceiling) Framing

Except where otherwise indicated joists shall have bearings not less than 4 inches on concrete or masonry and 1-1/2 inches on wood or metal. Joists, trimmers, headers, and beams framing into carrying members at the same relative levels shall be carried on joist hangers. Joists shall be lapped and spiked together at bearings or butted end-to-end with scab ties at joint and spiked to plates. Openings in floors shall be framed with headers and trimmers. Headers carrying more than two tail joists and trimmers supporting headers carrying more than one tail joist shall be doubled, unless otherwise indicated. Joists shall be doubled under partitions parallel with floor joists. Joists built into masonry shall be provided with a beveled fire cut so that the top of the joist does not enter the wall more than 1 inch. Engineered wood joists shall be installed in accordance with distributor's instructions.

3.1.5 Roof Framing or Rafters

Tops of supports or rafters shall form a true plane. Valley, ridge, and hip members shall be of depth equal to cut on rafters where practicable, but in no case less than depth of rafters. Valleys, hips, and ridges shall be straight and true intersections of roof planes. Necessary crickets and

watersheds shall be formed. Rafters, except hip and valley rafters, shall be spiked to wall plate and to ceiling joists with no less than three 8-penny nails. Rafters shall be toe-nailed to ridge, valley, or hip members with at least three 8-penny nails. Rafters shall be braced to prevent movement until permanent bracing, decking or sheathing is installed. Hip and valley rafters shall be secured to wall plates by clip angles. Openings in roof shall be framed with headers and trimmers. Unless otherwise indicated, headers carrying more than two rafters and trimmers supporting headers carrying more than one rafter shall be double. Hip rafters longer than the available lumber shall be butt jointed and scabbed. Valley rafters longer than the available lumber shall be double, with pieces lapped not less than 4 feet and well spiked together. Trussed rafters shall be installed in accordance with TPI HIB. Engineered wood joists shall be installed in accordance with distributor's instructions.

3.2 INSTALLATION OF SHEATHING

3.2.1 Plywood and Wood Structural Panels

Sheathing shall be applied with edges 1/8 inch apart at side and end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center unless otherwise shown. Nailing of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates, and if applied horizontally the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall be applied with long dimension at right angles to supports, end joints made over supports, and end joints staggered.

3.2.2 Wood

Sheathing end joints shall be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall be nailed at each support using two nails for boards 6 inches and less in width and three nails for boards more than 6 inches in width. Roof sheathing shall not be installed where roof decking is installed.

3.3 INSTALLATION OF SUBFLOORING

3.3.1 Plywood and Wood Structural Panel

Subflooring shall be applied with long dimension at right angles to the supports, with edges 1/8 inch apart at side and end joints, and nailed at supported edges 6 inches on center and at intermediate supports 12 inches on center unless otherwise shown. Subflooring may be installed with adhesive conforming to ASTM D 3498 and nails spaced at 12 inches on center unless otherwise shown. Each panel shall have end joints made over supports and end joints staggered. Where finish flooring of different thicknesses is used in adjoining areas, wood strips of the thickness required to bring the finish flooring surfaces into the same plane shall be used under the plywood subfloor.

3.3.2 Wood

Subflooring shall be applied diagonally with end joints made over supports. Each board shall bear on at least three supports and shall be nailed at each support using two nails for boards 6 inches and less in width and three nails for boards more than 6 inches in width.

3.4 INSTALLATION OF UNDERLAYMENT

3.4.1 Plywood

Underlayment shall be applied with edges 1/32 inch apart at joints and nailed at edges 6 inches on center and at 8 inches on center throughout remainder of panel for panels 11/32 inch and thicker. Thinner panels shall be nailed at edges 3 inches on center and at 6 inches on center throughout remainder of panel. Nailing at edges shall be 3/8 inch from edges. A clearance of 1/4 inch shall be provided at walls. Joints of underlayment shall not be located directly over parallel joints of subflooring. Power-driven wire staples of lengths recommended by the underlayment manufacturer may be used in lieu of nails. When plywood combination subfloor-underlayment is used in lieu of separate layers, it shall be installed as specified for plywood subfloor, except all joints shall be made over supports with edge and joints spaced 1/8 inch apart. When plywood combination subfloor-underlayment is tongued and grooved, only end joints shall require support. Tongued and grooved combination subfloor-underlayment shall be applied with joints spaced 1/8 inch apart. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface. For floors receiving a vinyl finish flooring, a separate layer of fully-sanded underlayment shall be installed as provided for above over combination subfloor-underlayment panels.

3.5 INSTALLATION OF SHEAR WALLS

Plywood or wood structural panels shall be installed with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports. Shear wall construction, nailing, and top and bottom anchorage shall be as shown.

3.6 INSTALLATION OF MISCELLANEOUS WOOD MEMBERS

3.6.1 Bridging

Wood bridging shall have ends accurately bevel-cut to afford firm contact and shall be nailed at each end with two nails. Metal bridging shall be installed as recommended by the manufacturer. The lower ends of bridging shall be driven up tight and secured after subflooring or roof sheathing has been laid and partition framing installed.

3.6.2 Corner Bracing

Corner bracing shall be installed when required by type of sheathing used or when siding, other than panel siding, is applied directly to studs. Corner bracing shall be let into the exterior surfaces of the studs at an angle of approximately 45 degrees, shall extend completely over wall plates, and shall be secured at each bearing with two nails.

3.6.3 Blocking

Blocking shall be provided as necessary for application of siding, sheathing, subflooring, wallboard, and other materials or building items, and to provide firestopping. Blocking for firestopping shall ensure a maximum dimension of 8 feet for any concealed space. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

3.6.4 Nailers and Nailing Strips

Nailers and nailing strips shall be provided as necessary for the attachment of finish materials. Nailers used in conjunction with roof deck installation shall be installed flush with the roof deck system. Stacked nailers shall be assembled with spikes or nails spaced not more than 18 inches on center and staggered. Beginning and ending nails shall not be more than 6 inches for nailer end. Ends of stacked nailers shall be offset approximately 12 inches in long runs and alternated at corners. Anchors shall extend through the entire thickness of the nailer. Strips shall be run in lengths as long as practicable, butt jointed, cut into wood framing members when necessary, and rigidly secured in place. Nailers and nailer installation for Factory Mutual wind uplift rated roof systems specified in other Sections of these specifications shall conform to the recommendations contained in FM LPD 1-49.

3.6.5 Wood Grounds

Wood grounds shall be provided as necessary for attachment of trim, finish, and other work to plaster. Grounds shall be run in lengths as long as practicable, butt jointed, and rigidly secured in place.

3.6.6 Furring Strips

Furring strips shall be provided at the locations shown. Furring strips shall be installed at 16 inches on center unless otherwise shown, run in lengths as long as practicable, butt jointed and rigidly secured in place.

3.6.7 Rough Bucks and Frames

Rough bucks shall be set straight, true, and plumb, and secured with anchors near top and bottom of each wood member and at intermediate intervals of not more than 3 feet. Anchors for concrete shall be expansion bolts, and anchors for masonry shall be 3/16 x 1-1/4 inch steel straps extending not less than 8 inches into the masonry and turned down 2 inches into the masonry.

3.6.8 Sill Plates

Sill plates shall be set level and square and anchor bolted at not more than 6 feet on centers and not more than 12 inches from end of each piece. A minimum of two anchors shall be used for each piece.

3.7 INSTALLATION OF INSULATION

Insulation shall be installed after construction has advanced to a point that the installed insulation will not be damaged by remaining work. For thermal insulation the actual installed thickness shall provide the R-values shown. For acoustical insulation the installed thickness shall be as shown. Insulation shall be installed on the weather side of such items as electrical boxes and water lines. Unless otherwise specified, installation shall be in accordance with the manufacturer's recommendation.

3.8 INSTALLATION OF VAPOR RETARDER

Vapor retarder shall be applied to provide a continuous barrier at window and door frames, and at all penetrations such as electrical outlets and switches, plumbing connections, and utility service penetrations. Joints in the vapor retarder shall be lapped and sealed according to the manufacturer's recommendations.

3.9 TABLES

TABLE I. SPECIES AND GRADE

Subflooring, Roof Sheathing, Wall Sheathing, Furring						
Grading Rules	Species	Const Standard	No. 2 Comm	No. 2 Board Comm	No. 3 Comm	
NELMA Grading Rules						
	Northern White Cedar					X
	Eastern White Pine	X				
	Northern Pine	X				
	Balsam Fir					X
	Eastern Hemlock-Tamarack					X
SPIB Rules						
	Southern Pine		X			
WCLIB 17						
	Douglas Fir-Larch	X				
	Hem-Fir	X				
	Sitka Spruce	X				
	Mountain Hemlock	X				
	Western Cedar	X				
WWPA Grading Rules						
	Douglas Fir-Larch	X				
	Hem-Fir	X				
	Idaho White Pine	X				
	Lodgepole Pine				X	
	Ponderosa Pine				X	
	Sugar Pine				X	
	Englemann Spruce				X	
	Douglas Fir South				X	
	Mountain Hemlock				X	
	Subalpine Fir				X	
	Western Cedar				X	

TABLE II. SPECIES AND GRADE

Wood Bumpers			
Grading Rules	Species	No. 1	No. 2
NHLA Rules			
	Red Oak	X	
NELMA Grading Rules			
	Northern Pine		X
	Eastern Hemlock-Tamarack		X
SPIB Rules			
	Southern Pine	X	

TABLE II. SPECIES AND GRADE

Wood Bumpers			
Grading Rules	Species	No. 1	No. 2
WCLIB 17	Douglas Fir-Larch		X
	Hem-Fir		X
WWPA Grading Rules	Douglas Fir-Larch		X
	Hem-Fir		X
	Douglas Fir-South		X

-- End of Section --

SECTION 06200A

FINISH CARPENTRY

11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM F 547 (1977; R 1995) Definitions of Terms
Relating to Nails for Use with Wood and
Wood-Based Materials

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C9 (1997) Plywood - Preservative Treatment by
Pressure Processes

AWPA M4 (1999) Standard for the Care of
Preservative-Treated Wood Products

AWPA P5 (2000) Standards for Waterborne
Preservatives

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds (1999) Architectural Woodwork Quality
Standards

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules (1997) Standard Grading Rules for
Northeastern Lumber

REDWOOD INSPECTION SERVICE (RIS)

RIS GCRL (1987) Grades of California Redwood Lumber

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec (1986; Supple No. 1, Aug 1993) Standard
Specifications for Grades of Southern
Cypress

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB Rules (1994; Supple 8 thru 11) Standard Grading
Rules for Southern Pine Lumber

U.S. DEPARTMENT OF COMMERCE (DOC)

PS-1	(1996) Voluntary Product Standard - Construction and Industrial Plywood
WEST COAST LUMBER INSPECTION BUREAU (WCLIB)	
WCLIB 17	(1996; Supples VII(A-E), VIII(A-C)) Grading Rules for West Coast Lumber
WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)	
WWPA Grading Rules	(1999) Western Lumber Grading Rules 95
WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMPMA)	
WMPMA WM 6	(1987) Industry Standard for Non-Pressure Treating of Wood Millwork

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Finish Carpentry
Handrails
Stair pickets

Drawings showing fabricated items and special mill and woodwork items. Drawings shall indicate materials and details of construction, methods of fastening, erection, and installation.

SD-04 Samples

Handrails
Stair pickets
Screen wire

Samples shall be of sufficient size to show patterns, color ranges, and types, as applicable, of the material proposed to be used.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well-ventilated areas, and protected from extreme changes in temperature and humidity.

PART 2 PRODUCTS

2.1 WOOD ITEMS, SIDING, AND TRIM

The Contractor shall furnish products which optimize design by reducing the amount of wood used (engineered wood), by using recycled wood products and preservatives without arsenic or chromium when the products and methods are

competitive in price or directed by the Contracting Officer. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

2.1.1.1 Grading and Marking

Materials shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood, wood structural panels, and lumber, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be architecturally exposed to view shall not bear grademarks, stamps, or other types of identifying marks.

2.1.1.2 Sizes and Patterns

Lumber sizes and patterns shall conform to rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Sizes and patterns for materials other than lumber shall conform to requirements of the rules or standards under which produced. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

2.1.1.3 Moisture Content

The maximum moisture content of untreated trim and wood siding shall be 15 percent at the time of delivery to the jobsite and when installed. Moisture content of all other material shall be in accordance with the standard under which the product is produced.

2.1.1.4 Preservative Treatment

2.1.1.4.1 Plywood

Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 0.25 pcf intended for above ground use.
- b. 0.4 pcf intended for ground contact and fresh water use.

2.1.1.4.2 Exterior Wood Molding and Millwork

Exterior wood molding and millwork within 18 inches of soil, in contact with water or concrete shall be preservative-treated in accordance with WMMPA WM 6. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil.

2.1.1.5 Soffits

2.1.1.5.1 Hardboard and Plywood

Hardboard and plywood soffits shall be siding grade hardboard, 3/8 or 7/16 inch thick; plywood, PS-1, exterior type, Grade A-C.

2.1.6 Fascias and Trim

2.1.6.1 Wood

Fascias and trim, including exterior door and window casing, shall be species and grade listed in TABLE I at the end of this section. Sizes shall be as indicated. Metal corners may be furnished in lieu of wood cornerboards for horizontal siding; and if furnished, shall be galvanized steel and primed or aluminum and primed.

2.1.7 Moldings

Moldings shall be of the pattern indicated and shall be of a grade compatible with the finish specified.

2.1.8 Woodwork Items

2.1.8.1 Utility Shelving

Utility shelving shall be a suitable species equal to or exceeding requirements of No. 3 Common white fir under WWPA Grading Rules, 1 inch thick; or plywood, interior type, Grade A-B, 1/2 inch thick, any species group.

2.2 NAILS

Nails shall be the size and type best suited for the purpose and shall conform to ASTM F 547. Nails shall be hot-dip galvanized or aluminum when used on exterior work. For siding, length of nails shall be sufficient to extend 1-1/2 inches into supports, including wood sheathing over framing. Screws for use where nailing is impractical shall be size best suited for purpose.

2.3 INSECT SCREEN

Insect screen shall be aluminum, plain weave, 18 inch by 18 inch mesh, charcoal color finish.

2.4 SCREEN WIRE

Screen wire shall be aluminum, plain weave, 3/8 inch square mesh, bright finish.

PART 3 EXECUTION

3.1 GENERAL

3.2 SOFFITS

3.2.1 Wood

Panels shall be applied with edges at joints spaced in accordance with manufacturer's instructions and with all edges backed with framing members. Panels shall be nailed 3/8 inch from edges at 6 inches on center and at intermediate supports at 12 inches on center. Panels shall be installed

using the maximum practical lengths.

3.3 FASCIAS AND EXTERIOR TRIM

Exposed surfaces and square edges shall be machine sanded, caulked, and constructed to exclude water. Joints of built-up items, in addition to nailing, shall be glued as necessary for weather-resistant construction. End joints in built-up members shall be well distributed. Joints in flat work shall be shouldered. Backs of wide-faced miters shall be held together with metal rings and glue. Fascias and other flat members shall be in maximum practicable lengths. Cornices shall be braced, blocked, and rigidly anchored for support and protection of vertical joints.

3.4 MOLDING AND INTERIOR TRIM

Molding and interior trim shall be installed straight, plumb, level and with closely fitted joints. Exposed surfaces shall be machine sanded at the mill. Molded work shall be coped at returns and interior angles and mitered at external corners. Intersections of flatwork shall be shouldered to ease any inherent changes in plane. Window and door trim shall be provided in single lengths. Blind nailing shall be used to the extent practicable, and face nailing shall be set and stopped with a nonstaining putty to match the finish applied. Screws shall be used for attachment to metal; setting and stopping of screws shall be of the same quality as required where nails are used.

3.5 FINISH STAIRWORK

Finish stairwork shall conform to AWI Qual Stds, Custom Grade for opaque finish. Stairwork shall be erected to form a strong, rigid structure without squeaks or vibrations. Railings shall be secured with concealed fasteners. Wall rails shall be supported on metal brackets spaced near ends and not over 5 feet on centers.

3.6 WOODWORK ITEMS

3.6.1 Shelving

Shelving shall be anchored to supporting construction. Unless otherwise indicated, shelves shall be supported by wall-supported brackets not more than 24 inches on center or as required to limit deflection to 1/4 inch between supports with a load of 35 lb per lineal foot. Adjustable shelf hardware shall be steel standards, channel shaped, with 1 inch adjustment slots and brackets designed for attachment to standards.

3.6.2 Clothes Hanger Rods

Rods shall be provided where indicated and in all closets having hook strips. Rods shall be hardwood 1-1/2 inches in diameter. Rods shall be set parallel with the front edges of the shelving, and shall be supported at each end by suitable sockets, and by intermediate brackets spaced at not more than 4 foot centers.

3.7 TABLES

TABLE I. SPECIES AND GRADE TABLES

Grading Rules	Species	Choice	Clear	C Select	C & Better
NELMA Grading Rules					
	Eastern Cedar				X
	Eastern Hemlock		X		
	Tamarack				X
	Eastern W. Pine				X
	Northern Pine				X
	Eastern Spruce			X	
	Balsam Fir		X		
RIS GCRL	Redwood		X		
SCMA Spec	Cypress			X	
SPIB Rules	Southern Pine				X
WCLIB 17	Douglas Fir				X
	Larch				X
	Hemlock Fir				X
	Mountain Hemlock				X
	Sitka Spruce				X
WWPA Grading Rules					
	Douglas Fir				X
	Larch				X
	Hemlock Fir		X		
	Mountain Hemlock				X
	Western Larch		X		
	Idaho White Pine	X			
	Lodgepole Pine		X		
	Ponderosa Pine		X		
	Sugar Pine		X		
	Englemann Spruce		X		
	Douglas Fir South		X		
	Subalpine Fir		X		

NOTE 1: Western Cedar under WCLIB 17 shall be Grade B; and under WWPA Grading Rules, Western Cedar shall be Grade B bevel for siding and Grade A for trim.

NOTE 2: Except as specified in NOTE 3 below, siding and exterior trim shall be any of the species listed above. Interior trim shall be any one of the species listed above and the highest grade of the species for stain or natural finish and one grade below highest grade of species for paint finish.

NOTE 3: Southern Yellow Pine, Douglas Fir, Larch, Western Larch, and Tamarack shall not be used where painting is required and may be used on exterior work only when approved and stained with a preservative type stain.

-- End of Section --

SECTION 06650

SOLID POLYMER (SOLID SURFACING) FABRICATIONS
10/00

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A136.1	(1992) Organic Adhesives for Installation of Ceramic Tile
ANSI Z124.3	(1995) Plastic Lavatories
ANSI Z124.6	(1997) Plastic Sinks

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 570	(1998) Water Absorption of Plastics
ASTM D 638	(1999) Tensile Properties of Plastics
ASTM D 696	(1998) Coefficient of Linear Thermal Expansion of Plastics Between Minus 30 degrees C and 30 degrees C
ASTM D 2583	(1995) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM G 21	(1996) Determining Resistance of Synthetic Polymeric Materials to Fungi
ASTM G 22	(1976; R 1996) Determining Resistance of Plastics to Bacteria

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3	(1995) High-Pressure Decorative Laminates
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1.2 GENERAL DESCRIPTION

Work in this section includes countertops with integral lavatories and backsplashes and other items utilizing solid polymer (solid surfacing) fabrication as shown on the drawings and as described in this specification.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings
Installation

Shop Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work.

SD-03 Product Data

Solid polymer material
Qualifications
Fabrications

Product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

SD-04 Samples

Material; G

A minimum 4 by 4 inch sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work.

Counter Tops

A minimum 1 foot wide by 6 inch deep, full size sample for each type of counter top shown on the project drawings. The sample shall include the edge profile and backsplash as detailed on the project drawings. Solid polymer material shall be of a pattern and color as indicated on the drawings. Sample shall include at least one seam. Approved sample shall be retained as standard for this work.

SD-06 Test Reports

Solid polymer material

Test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

SD-07 Certificates

Fabrications
Qualifications

Solid polymer manufacturer's certification attesting to fabricator qualification approval.

SD-10 Operation and Maintenance Data

Solid polymer material
Clean-up

A minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Maintenance video shall be provided, if available. Maintenance kit for matte finishes shall be submitted.

1.4 DELIVERY, STORAGE AND HANDLING

Materials shall not be delivered to project site until areas are ready for installation. Materials shall be stored indoors and adequate precautions taken to prevent damage to finished surfaces. Protective coverings shall be provided to prevent physical damage or staining following installation, for duration of project.

1.5 WARRANTY

Manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat, shall be provided. Warranty shall provide for material and labor for replacement or repair of defective material for a period of ten years after component installation.

1.6 QUALIFICATIONS

To insure warranty coverage, solid polymer fabricators shall be certified to fabricate by the solid polymer material manufacturer being utilized. All fabrications shall be marked with the fabricator's certification label affixed in an inconspicuous location. Fabricators shall have a minimum of 5 years of experience working with solid polymer materials.

1.7 MOCK-UP

Prior to final approval of shop drawings, a full-size mock-up shall be provided of a typical countertop where multiple units are required. The mock-up shall include all solid polymer components required to provide a completed unit. The mock-up shall utilize finishes in patterns and colors indicated on the drawings. Should the mock-up not be approved, the Contractor shall re-work or remake it until approval is secured. Rejected units shall be removed from the jobsite. Approved mock-up may remain as part of the finished work.

PART 2 PRODUCTS

2.1 MATERIAL

Solid polymer material shall be a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting ANSI Z124.3 and ANSI Z124.6 requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of 0.01

inch shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall material be less than 1/4 inch in thickness.

2.1.1 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material shall be composed of acrylic polymer, mineral fillers, and pigments and shall meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4100 psi (min.)	ASTM D 638
Hardness	50-Barcol Impressor (min.)	ASTM D 2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D 696
Boiling water Surface Resistance	No Change	NEMA LD 3-3.05
High Temperature Resistance	No Change	NEMA LD 3-3.06
Impact Resistance (Ball drop)		NEMA LD 3-303
1/4" sheet	36", 1/2 lb ball, no failure	
1/2" sheet	140", 1/2 lb ball, no failure	
3/4" sheet	200", 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G 21
Bacteria Growth	No Growth	ASTM G 22
Liquid Absorption (Weight in 24 hrs.)	0.1% max.	ASTM D 570
Flammability		ASTM E 84
Flame Spread	25 max.	
Smoke Developed	30 max	

2.1.2 Material Patterns and Colors

Patterns and colors for all solid polymer components and fabrications shall be those indicated on the project drawings. Pattern and color shall occur, and shall be consistent in appearance, throughout the entire depth

(thickness) of the solid polymer material.

2.1.3 Surface Finish

Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be matte; gloss rating of 5-20.

2.2 ACCESSORY PRODUCTS

Accessory products, as specified below, shall be manufactured by the solid polymer manufacturer or shall be products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.

2.2.1 Seam Adhesive

Seam adhesive shall be a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive shall be approved by the solid polymer manufacturer. Adhesive shall be color-matched to the surfaces being bonded where solid-colored, solid polymer materials are being bonded together. The seam adhesive shall be clear or color matched where particulate patterned, solid polymer materials are being bonded together.

2.2.2 Panel Adhesive

Panel adhesive shall be neoprene based panel adhesive meeting ANSI A136.1, Underwriter's Laboratories (UL) listed. This adhesive shall be used to bond solid polymer components to adjacent and underlying substrates.

2.2.3 Silicone Sealant

Sealant shall be a mildew-resistant, FDA and UL listed silicone sealant or caulk in a clear formulation. The silicone sealant shall be approved for use by the solid polymer manufacturer. Sealant shall be used to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.

2.2.4 Conductive Tape

Conductive tape shall be manufacturer's standard foil tape, 4 mils thick, applied around the edges of cut outs containing hot or cold appliances.

2.2.5 Insulating Felt Tape

Insulating tape shall be manufacturer's standard product for use with drop-in food wells used in commercial food service applications to insulate solid polymer surfaces from hot or cold appliances.

2.3 FABRICATIONS

Components shall be factory or shop fabricated to the greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and manufacturer's requirements. Factory cutouts shall be provided for lavatories and plumbing fittings where indicated on the drawings. Contours and radii shall be routed to template, with edges smooth. Defective and inaccurate work will be rejected.

2.3.1 Joints and Seams

Joints and seams shall be formed between solid polymer components using manufacturer's approved seam adhesive. Joints shall be inconspicuous in appearance and without voids to create a monolithic appearance.

2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Edge shapes and treatments, including any inserts, shall be as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter Top Splashes

Backsplashes and end splashes shall be fabricated from 1/2 inch thick solid surfacing material and shall be 4 inches high unless otherwise indicated. Backsplashes and end splashes shall be provided for all counter tops. Backsplashes shall be shop fabricated and be permanently attached.

2.3.3.1 Permanently Attached Backsplash

Permanently attached backsplashes shall be attached with seam adhesive and to form a radiused coved transition from countertop to backsplash.

2.3.3.2 End Splashes

End splashes shall be provided loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Counter Tops

All solid surfacing, solid polymer counter top components shall be fabricated from 1/2 inch thick material. Edge details, dimensions, locations, and quantities shall be as indicated on the Drawings. Counter tops shall be complete with permanently attached with coved transition backsplash and loose endsplashes at all locations. Attach 2 inch wide reinforcing strip of polymer material under each horizontal counter top seam.

2.3.4.1 Counter Top With Lavatory (Bowl)

A. One-Piece Counter Top and Bowl

2.3.4.2 Vanity Tops With Bowls

Vanity top and bowl fabrications shall be a standard pre-fabricated product provided by the solid polymer manufacturer. Each unit shall include a vanity top with backsplash and sink bowl.

2.3.5 Solid Polymer Counter Lavatories (Bowls)

Solid polymer counter bowls shall be a standard product of the solid polymer manufacturer, designed specifically to be installed in solid polymer vanity tops. Bowls shall be of the same polymer composition as the adjoining counter top. Bowl design shall support a seam adhesive undermount installation method. Bowl dimensions shall be as indicated on the drawings.

PART 3 EXECUTION

3.1 COORDINATION

In most instances, installation of solid polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer fabricator/installer and other trades to insure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of countertops and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer. Contractor shall appropriate staging areas for solid polymer fabrications.

3.2 INSTALLATION

3.2.1 Components

All components and fabricated units shall be installed plumb, level, and rigid. Field joints between solid polymer components to provide a monolithic appearance shall be made using solid polymer manufacturer's approved seam adhesives, with joints inconspicuous in the finished work. Solid polymer lavatories and bowls shall be installed using a color-matched seam adhesive. Plumbing connections to sinks and lavatories shall be made in accordance with Section 15400 PLUMBING, GENERAL PURPOSE.

3.2.2 Silicone Sealant

A clear, silicone sealant shall be used to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead shall be smooth and uniform in appearance and shall be the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Bead shall be continuous and run the entire length of the joint being sealed.

3.2.3 Plumbing

Plumbing connections to lavatories (bowls) shall be made in accordance with Section 15400 PLUMBING, GENERAL PURPOSE.

3.3 CLEAN-UP

Components shall be cleaned after installation and covered to protect against damage during completion of the remaining project items. Components damaged after installation by other trades will be repaired or replaced at the General Contractor's cost. Component supplier will provide a repair/replace cost estimate to the General Contractor who shall approve estimate before repairs are made.

-- End of Section --

SECTION 07110A

BITUMINOUS DAMPPROOFING
09/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 41 (1994) Asphalt Primer Used in Roofing,
Dampproofing, and Waterproofing

ASTM D 4479 (1993) Asphalt Roof Coatings - Asbestos Free

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Materials

Certificates attesting that the materials meet the requirements specified.

1.3 QUALIFICATIONS

Work shall be performed by skilled laborers thoroughly experienced in the type of bituminous dampproofing work specified to meet the requirements of the contract.

1.4 DELIVERY, STORAGE AND HANDLING

Dampproofing materials shall be delivered to the project site in the original sealed containers bearing the name of manufacturer, contents and brand name, and stored in a weathertight enclosure to prevent moisture damage and absorption. Dampproofing materials shall be protected from freezing. Asphalt shall be stored off the ground on pallets, and covered on top and all sides with breathable-type canvas tarpaulins. Plastic sheets cause condensation buildup; and therefore, shall not be used to cover dampproofing materials. Care shall be taken during storage to avoid separation or settlement of the emulsion components. Damaged or deteriorated materials shall be removed from the project site.

PART 2 PRODUCTS

2.1 SOLVENT-BASED ASPHALT DAMPPROOFING

2.1.1 Asphaltic Primer

Primer for cold-applied solvent-based asphalt dampproofing shall conform to ASTM D 41, asbestos-free, non-fibrated, manufactured with highly ductile soft asphalts and selected hydrocarbons.

2.1.2 Fibrated Asphalt

Fibrated solvent-based asphalt dampproofing shall be cold-applied type conforming to ASTM D 4479 Type I, asbestos-free, manufactured with selected asphalts, stabilizers, mineral spirits and fibrated with mineral fibers. Solvent-based asphalt shall contain 72 percent solids by weight, 65 percent solids by volume.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces scheduled for bituminous dampproofing shall be prepared in accordance with dampproofing manufacturer's recommendations. Surface preparation shall be approved prior to dampproofing application.

3.1.1 Protection of Surrounding Areas

Before starting the dampproofing work, the surrounding areas and surfaces shall be protected from spillage and migration of asphalt onto other work. Drains and conductors shall be protected from clogging with asphalt.

3.1.2 Masonry Surfaces

Surfaces shall be free of oil, grease, dirt, laitance, loose material, frost, debris and other contaminants. Mortar joints shall be flush and free of extraneous mortar and chipped or broken masonry.

3.1.3 Metal Surfaces

Metal surfaces shall be dry and be free of rust, scale, loose paint, oil, grease, dirt, frost and debris.

3.2 APPLICATION OF BITUMINOUS DAMPPROOFING

3.2.1 Solvent-Based Asphalt

Solvent-based asphalt dampproofing work shall not be performed in temperatures below 40 degrees F. Dampproofing materials shall be applied in accordance with manufacturer's published instructions to produce a smooth uniform dry film not less than 12 mils thick without voids or defects. Dull or porous spots shall be recoated. Dampproofing materials shall seal tightly around pipes and other items projecting through dampproofing. Rates of application shall be as follows:

a. Primer: 1/2 gallon per 200 square feet, cold-applied.

b. Dampproofing Coat: 2 gallons per 100 square feet, cold-applied with spray, brush or trowel.

3.3 CLEAN-UP

Surfaces of other work which are stained with dampproofing materials shall be cleaned with a cleaner recommended by dampproofing manufacturer.

3.4 PROTECTION

The completed dampproofing work shall be protected from damage during and after construction.

-- End of Section --

SECTION 07161

METALLIC OXIDE WATERPROOFING

09/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1997) Concrete Aggregates
ASTM C 144	(1997) Aggregate for Masonry Mortar
ASTM C 150	(1997; Rev. A) Portland Cement

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-04 Samples

Metallic waterproofing

SD-06 Test Reports

Iron content of metallic waterproofing

Oxidizing agent content of metallic waterproofing

Provide certified statement attesting that chemical and physical composition of metallic waterproofing material have been determined by specified testing methods and material has been found to conform with specification requirements.

SD-08 Manufacturer's Instructions

Mixing

1.3 TESTING OF SAMPLES

Prepare a 100 gram sample. Using a magnet over a watch glass, transfer magnetic portion into separate pile leaving nonmagnetic behind. Weigh nonmagnetic portion.

- a. Total iron content: Determine total iron by percentage of sample weight using standard qualitative chemical analysis procedures.
- b. Oxidizing agent content: Determine percentage of oxidizing agent by standard qualitative chemical analysis technique.

1.4 SAMPLE INSTALLATION

After submittals are approved and before work is started apply metallic waterproofing to a test area not less than 100 square feet, using methods and materials specified herein. Location to be selected by Contracting Officer. Waterproofing shall be visually and physically examined for bond and loose materials by waterproofing materials manufacturer or his representative. A wide-blade putty knife or similar tool will be used for inspection of bond. Failure of waterproofing to bond or appearance of excessive loose materials will be cause for disapproval of proposed material and method of application. Clean disapproved test area free of applied finish, leaving base clean and acceptable for new application. If test area is disapproved, make an additional test area. Do not apply waterproofing in other areas until application of test area has been approved by waterproofing materials manufacturer or his representative, and accepted by Contracting Officer. Approved installation shall remain in place and open to observation as criteria for all metallic waterproofing under contract.

1.5 DELIVERY AND STORAGE

Deliver materials to project site in original sealed containers with manufacturer's name and brand clearly identified. Store in dry locations with adequate ventilation and handle in a manner to prevent damage or contamination.

1.6 ENVIRONMENTAL CONDITIONS

Enclose or protect surfaces to be treated from excessive temperature changes. Ambient temperature shall be above 50 degrees F during application and for duration of curing period. Keep water level below location of surfaces being treated until completion of the treatment and curing period. Provide adequate ventilation to properly oxidize metallic waterproofing.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT

ASTM C 150, Type I.

2.2 FINE AGGREGATE

ASTM C 144 (sand) for waterproofing coats and ASTM C 33 for protective coat.

2.3 WATER

Potable and free from injurious amounts of oil, alkalis, acids, organic matter, and other deleterious substances.

2.4 METALLIC WATERPROOFING COMPOUND

Clean, commercial, pulverized cast iron mixed in dust-confining container with chemical oxidizing agent such as sodium peroxide, potassium peroxide, or ammonium chloride.

2.4.1 Pulverized Cast Iron

85 percent minimum by weight of metallic iron of magnetic portion. Chemical oxidizing agent content shall be a minimum of 3 percent and a

maximum of 5 percent by weight of compound. Presence of dirt, paraffin, bitumen, or other foreign substances in excess of one percent by weight of waterproofing compound will be cause for rejection.

2.4.2 Iron Oxide Content

Do not exceed 5 percent by weight of magnetic iron. The magnetic portion of iron shall not contain more than 0.05 percent by weight of oil.

2.4.3 Magnetic Iron Particles

Graded as follows:

<u>Sieve size</u>	<u>Percent passing</u>
No. 20 screen	100
No. 35 screen	95 to 100
No. 40 screen	90 to 100
No. 60 screen	65 to 100
No. 100 screen	45 to 70
No. 200 screen	10 to 25

2.5 CALKING

Polyurethane foam sealant.

PART 3 EXECUTION

3.1 SURFACE CONDITION

Examine all surfaces to be waterproofed to ensure that concrete has properly cured, all shrinkage has occurred, laitance has been removed, cracks and honeycombs have been cut out and filled, and surfaces have been roughened to provide bond for waterproofing material. Correct all defects that will adversely affect proper completion of waterproofing.

3.2 SURFACE PREPARATION

3.2.1 Concrete Surfaces

Roughen concrete wall and floor surfaces by light bushhammering, sandblasting, acid etching, or high pressure water cleaning to provide firm, unspalled granular surface, clean and free from loose materials, debris, and detrimental substances such as dust, dirt, oil, grease, or other coatings.

3.2.2 Walls

Clean wall areas that have been cut out, moisten with water, and fill flush with a stiff mortar mix composed of one 94 pound sack of portland cement, 188 pounds of sand, and 15 pounds of metallic oxide waterproofing compound.

Apply filling and patching in layers not exceeding 3/4 inch thickness, worked into voids, compacted, and finished flush with adjacent surfaces. Roughen patched areas to provide level, firm, granular surface.

3.2.3 Grooves, Joints, and Intersections

Strip, clean, and remove all loose material from construction joints, grooved recesses, and intersections of vertical and horizontal surfaces. Pack joints with waterproofing mortar mixed in proportions of one 94 pound sack of portland cement and 188 pounds of sand, and 15 pounds of metallic oxide waterproofing compound. Finish compacted mortar flush with adjacent surfaces; finish internal angles to a round cove. Grooves in construction joints, at intersections of horizontal and vertical surfaces, and fillers and water stops for expansion and contraction joints are specified under Section 07900A JOINT SEALING.

3.2.4 Calking

Apply calking around all drains, pipes, and other items which penetrate the surfaces to be waterproofed.

3.2.5 Recesses

Waterproof recesses, but do not fill to a lesser opening than detailed.

3.2.6 Penetrations

Do not apply waterproofing until anchorage items or other items passing through or protruding from the surfaces have been installed. Treatment shall be completed and approved prior to attachment of utilities to anchorage items.

3.3 MIXING

Follow mixing instructions supplied by the manufacturer.

3.4 APPLICATION

3.4.1 Limits of Application

Completely coat columns integral with exterior walls. Return wall waterproofing at least 24 inches on interior concrete walls and 48 inches onto masonry walls that are in place at the time of the waterproofing application. Return floor waterproofing at least 12 inches vertically up on the face of all interior walls, partitions, and interior columns in place at the time of waterproofing application.

3.4.2 Walls and Columns

Thoroughly dampen surfaces to receive waterproofing. Apply two coats of thick slurry to each 100 square feet of surface: first coat, consisting of 94 pounds of portland cement, 188 pounds of sand, and 10 pounds of metallic oxide waterproofing compound; second coat, same mix as first coat except with 8 pounds of metallic oxide waterproofing for each 94 pounds of cement.

Apply each coat by brushing with stiff bristle brushes to seal all pores. Allow sufficient time between coats to permit oxidation of material, but not more than 24 hours before application of subsequent treatment. Periodically spray each coat with fine fog spray during oxidation period to ensure thorough curing. Where air circulation is insufficient to properly oxidize waterproofing, provide fans or other means to ensure adequate circulation.

3.4.3 Protective Finish Coating

Waterproofed surfaces which are not to receive plaster, floor topping, or other finish shall receive a protective coating applied directly over the bond coat.

3.4.3.1 Walls and Columns

After application of bond coat, apply protective coating to minimum thickness of 1/8 inch. Mix coating in proportions by volume of one part portland cement to two and one-half parts fine aggregate conforming to ASTM C 33. Float to smooth, even surface.

3.4.3.2 Floors

After application of bond coat, apply protective topping of 1 1/2 inch minimum thickness, consisting of one part portland cement, one part sand, and two parts fine aggregate conforming to ASTM C 33 and proportioned by volume. Mixing shall be done in a mechanical batching-type mixer for not less than 3 minutes after all materials have been included, using not more than 4 gallons of water for each bag of cement when floating is done by machine and 5 gallons for each bag of cement when floating is done by hand.

After screeding to established finish lines and levels, compact and then float with wood floats or power floating machines. After finish has sufficiently hardened to prevent excess fine material from being worked to surface, steel trowel to obtain smooth surface free from defects and blemishes. After topping has set to ring, trowel again to a burnished finish.

3.4.3.3 Curing

Protect finish coating from loss of moisture and cure by periodic fog spraying and cover with impervious sheeting or other approved method until coating has set.

-- End of Section --

SECTION 07214N

BOARD AND BLOCK INSULATION

09/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 203	(1992) Breaking Load and Flexural Properties of Block-Type Thermal Insulation
ASTM C 272	(1991; R 1996) Water Absorption of Core Materials for Structural Sandwich Constructions
ASTM C 578	(1995) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 930	(1992) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D 1621	(1994) Compressive Properties of Rigid Cellular Plastics
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM E 96	(2000) Water Vapor Transmission of Materials
ASTM E 136	(1996; Rev. A) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(1997) Installation of Oil Burning Equipment
NFPA 54	(1996) National Fuel Gas Code
NFPA 70	(1999) National Electrical Code
NFPA 211	(2000) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Block or board insulation

SD-08 Manufacturer's Instructions

Block or Board Insulation

Adhesive

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials to the site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.3.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.4 SAFETY PRECAUTIONS

1.4.1 Other Safety Considerations

Consider safety concerns and measures as outlined in ASTM C 930.

PART 2 PRODUCTS

2.1 BLOCK OR BOARD INSULATION

Provide only thermal insulating materials recommended by manufacturer for type of application indicated. Provide board or block thermal insulation conforming to the following standards and the physical properties listed below:

- a. Extruded Preformed Cellular Polystyrene: ASTM C 578

2.1.1 Thermal Resistance

As indicated.

2.1.2 Fire Protection Requirement

- a. Flame spread index of 75 or less when tested in accordance with ASTM E 84.
- b. Smoke developed index of 200 or less when tested in accordance with ASTM E 84.

2.1.3 Other Material Properties

Provide thermal insulating materials with the following properties:

- a. Rigid cellular plastics: Compressive Resistance at Yield: Not less than 10 pounds per square inch (psi) when measured according to ASTM D 1621.
- b. Flexural strength: Not less than 25 psi when measured according to ASTM C 203.
- c. Water Vapor Permeance: Not more than 1.1 Perms or less when measured according to ASTM E 96, desiccant method, in the thickness required to provide the specified thermal resistance, including facings, if any.
- d. Water Absorption: Not more than 2 percent by total immersion, by volume, when measured according to ASTM C 272.

2.1.4 Prohibited Materials

Do not provide materials containing more than one percent of asbestos.

2.2 ACCESSORIES

2.2.1 Adhesive

As recommended by insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that all areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation. If moisture or other conditions are found that do not allow the proper installation of the insulation, do not proceed but notify the Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Unless using insulation board that passes ASTM E 136 in addition to the requirements in Part 2, install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.
- b. Masonry chimneys or masonry enclosing a flue: 2 inches from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances required by NFPA 211.
- c. Vents and vent connectors used for venting products of combustion, flues, and chimneys other than masonry chimneys: minimum clearances as required by NFPA 211.
- d. Gas Fired Appliances: Clearances as required in NFPA 54.

- e. Oil Fired Appliances: Clearances as required in NFPA 31.

Blocking is not required if chimneys or flues are certified by the Manufacturer for use in contact with insulating materials.

3.3 INSTALLATION

3.3.1 Insulation Board

Install and handle insulation in accordance with the manufacturer's installation instructions. Keep material dry and free of extraneous materials. Observe safe work practices.

3.3.2 Electrical Wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.3 Continuity of Insulation

Butt tightly against adjoining boards. Provide continuity and integrity of insulation at corners, wall to ceiling joint, roof, and floor. Avoid creating any thermal bridges or voids.

3.4 INSTALLATION ON WALLS

3.4.1 Installation using Furring Strips

Install insulation between members as recommended by insulation manufacturer.

3.4.2 Adhesive Attachment to Existing Masonry Walls

Apply adhesive to wall and completely cover wall with insulation.

- a. Full back bed method or
- b. Spot method: Provide at least six spots having diameter of approximately 4 inches, located at each corner and mid-points of each of the longer sides of each board.

-- End of Section --

SECTION 07310

SLATE ROOFING
02/95

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 370	(1992) Copper Sheet and Strip for Building Construction
ASTM C 406	(1989; R 1996) Roofing Slate
ASTM D 146	(1997) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D 226	(1997) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA Arch. Manual	(1993; Errata; Addenda Oct 1997) Architectural Sheet Metal Manual
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Qualifications; G

Documentation showing qualifications of personnel proposed to perform the roofing work, and a listing identifying prior installations completed by the Contractor.

SD-04 Samples

Slate; G

Accessories for Slate Roofs

Three representative shingles to show color range.

Sealants

8 ounces of each type.

Underlayment Membrane

1 by 1 foot section.

Fasteners

Representative samples of each fastener with identifying tags.

SD-07 Certificates

Materials

Certificates of compliance attesting that the materials meet specification requirements.

1.3 QUALIFICATIONS

The Contractor shall provide qualified workers, trained and experienced in installing slate roofing systems of this configuration, and shall submit documentation of 5 consecutive years of work of this type. The Contractor shall be familiar with and shall perform work in accordance with SMACNA Arch. Manual. A list of installations made shall be provided, identifying when, where, and for whom the installations were made.

1.4 DELIVERY, STORAGE AND HANDLING

Materials shall be delivered in manufacturer's unopened bundles and containers with the manufacturer's brand and name marked clearly thereon. Shingles shall be stored in accordance with manufacturer's printed instructions. Roll goods shall be stored on end in an upright position. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

1.5 PROJECT/SITE CONDITIONS

1.5.1 Environmental Requirements

Slate roofing work shall proceed when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.5.2 Material Storage

Materials shall not be stored on roof decks in such a manner as to overstress and/or damage the deck and supporting structure. Placing of loads at midspans of framing shall be avoided. Superimposed loads shall be well distributed.

1.5.3 Units of Work

Units of work shall be established, including removal of existing

materials, preparation of existing surfaces and application of underlayment and nailers, and related temporary and/or permanent flashing so that the unit of work can be completed prior to the end of each working day.

1.5.4 Temporary Protection Materials

Materials shall be provided and maintained on the site at all times for temporary roofing, flashing, and other protection when delays and/or changed weather conditions do not permit completion of each unit of work prior to the end of each working day. Materials which have been used for temporary roofing, flashing and other protection shall be removed and discarded.

1.6 WARRANTY

A warranty shall be furnished against defects in material and workmanship of slate roof assembly, including related metal flashing for a period of 10 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Existing Slate

Intact and serviceable existing slate materials shall be salvaged and reused whenever possible. New slate being incorporated into existing slate roofs shall match existing as closely as possible. Slate from the same quarry or manufacturer as the original shall be used if possible.

2.1.2 Slate

Slate shall conform to ASTM C 406. Slate shall be Grade A, (ASTM S1), hard, dense rock, punched or drilled for two nails each. Cracked slate shall not be used. Exposed corners shall be full. Broken corners on covered ends which sacrifice nailing strength or the laying of a watertight roof will not be allowed.

2.1.2.1 Standard Thickness Roofing Slate

Slate shall be smooth texture 3/16 to 1/4 inch thickness. Slate shall be the following sizes: graduated lengths and random widths.

2.1.2.2 Graduated Roof Slate

Slate shall be smooth texture from eave to ridge. Slate shall be in standard random widths graduated in length and shall be applied with standard 3 inch lap and exposures.

2.1.2.3 Slate Colors

Slate shall be unfading slate. Color shall match existing.

2.1.3 Underlayment Membrane

An underlayment membrane shall be furnished on all surfaces to be covered with slate. Membrane shall consist of asphalt-saturated felt or high strength composite self-adhering membrane.

2.1.3.1 Roofing Felt

Roofing felt shall be asphalt-saturated rag felt, Type II, No. 30 asphalt felt in accordance with ASTM D 226.

2.1.3.2 Elastomeric Membrane Underlayment

Membrane shall be a cold applied composite self-adhering membrane of not less than 0.004 inch high strength polyethylene film with slip resistant embossing, coated on one side with a thick layer of adhesive-consistency rubberized asphalt, interwound with a disposable silicone coated release sheet. The tensile strength and elongation values shall be not less than 250 psi when tested in accordance with ASTM D 412 and pliability shall be unaffected when tested in accordance with ASTM D 146.

2.1.3.3 Elastomeric Membrane Accessories

Two component urethane, mastic and primer shall be as approved by the membrane manufacturer. Flashing, expansion joint covers, temporary UV protection and corner fillets shall be as recommended by the membrane manufacturer.

2.1.4 Nails

Nails shall be large-headed slater's solid copper nails of Number 10 or 11 gauge metal. Nails shall be 3d for slates 18 inch or less in length; 4d nails shall be used for slates 20 inch or longer, and 6d nails shall be used for slates on hips and ridges. Thicker slates require longer and heavier gauge nails. The proper size shall be determined by adding 1 inch to twice the thickness of the slate. Nails shall be of sufficient length to adequately penetrate the roof sheathing. Nails used to retain copper flashing and slate at rake edges, hips, ridges, and eaves prone to wind damage shall be of the ring shank design.

2.1.5 Flashing

Flashing shall be 20 ounce, light cold-rolled temper (H00) copper conforming to ASTM B 370. Flashing shall be in accordance with the requirements as specified in Section 07600 SHEET METALWORK, GENERAL.

2.1.6 Elastic Cement

Elastic cement shall be an approved brand of waterproof elastic slater's cement colored to match as nearly as possible the general color of the slate.

PART 3 EXECUTION

3.1 PROTECTION OF ROOF SURFACES

Equipment (such as padded ridge ladders) and techniques shall be used which prevent damage to roof as a result of foot or material traffic. Contractor shall be responsible for controlling breakage of new or existing slate beyond what is indicated. The progression of work shall be laid out and presented to the Contracting Officer to prevent other trades from working on or above completed roofing. Personnel who are working on the roof shall have proper shoes which will not further damage slates, and shoe soles shall be made of a material which will aid in preventing falls.

3.2 SLATE REMOVAL

Where work involves partial replacement or repair of roof, Contractor shall verify each slate for tightness and continued use. Testing shall be done with broad, flat-nosed, slater's pliers. Slates which have been identified for replacement or re-installation shall be marked for approval within 30 days after Notice to Proceed. Slates identified for removal shall be marked with a non-destructive color mark removable by solvent, rather than water. Slates fastened with non-copper fasteners shall be re-fastened with proper copper fasteners.

3.3 PREPARATION OF SURFACES

Roof deck surfaces shall be smooth, clean, firm, dry, and free from loose boards, large cracks, and projecting ends that might damage the roofing. Foreign particles shall be cleaned from interlocking areas to ensure proper seating and to prevent water damming. Prior to installation of slate, vents and other projections through roofs shall be properly flashed and secured in position, and projecting nails shall be driven firmly home.

3.4 ROOFING FELT

Felt shall be laid in horizontal layers with joints lapped toward eaves and at ends at least 2 inches, and secured along laps and at ends as necessary to hold the felt in place and protect the structure until covered with the slate. Felt shall be preserved unbroken, tight and whole. Felt shall lap hips and ridges at least 12 inches to form a double thickness and shall be lapped 2 inches over the metal of valleys or built-in gutters.

3.5 ELASTOMERIC MEMBRANE UNDERLAYMENT

3.5.1 Surface Preparation

Dust, dirt, loose nails or other protrusions shall be removed. Priming is not required for wood or metal surfaces but is necessary on concrete or masonry surfaces.

3.5.2 Temperature

Membrane shall be applied only in fair weather when air and surface temperatures are above 40 degrees F.

3.5.3 Membrane Application

Membrane shall be applied according to manufacturer's instructions. Membrane shall be adhered directly to roof deck. The membrane shall be cut into 10 to 15 foot lengths and shall be re-rolled. The release paper shall be peeled back 1 to 2 feet; the membrane shall be aligned on the lower edge of the roof and the first 1 to 2 feet shall be placed. The release paper under the membrane shall be peeled from the membrane. The membrane shall be pressed in place. Lower edges shall be rolled firmly with a wallpaper or hand roller. For ice dam protection, membrane shall be applied to reach a point above the highest expected level of ice dams; refer to drawings for extent. Ends and edges shall be overlapped a minimum of 6 inches. Membrane shall not be folded onto an exposed face of the roof edge.

3.5.4 Valley and Ridge Application

The membrane shall be cut into 4 to 6 footlengths. The release paper sheet shall be peeled and centered over the valley or ridge, then draped and pressed in place, working from the center of the valley or ridge outward in each direction. For valleys, membrane shall be applied starting at the low point and working upwards. All sheets shall be overlapped a minimum of 6 inches.

3.5.5 Vertical Membrane Flashings

Vertical wall installations shall receive primer prior to the application of membrane. Primer shall be applied at a coverage rate of 250-350 sq. ft./gal. Membrane shall be turned up walls and dormers as indicated on the drawings. Vertical membrane terminations shall be mechanically fastened. Vertical terminations shall receive a troweling of mastic as approved by the membrane manufacturer. Membrane may be folded onto the fascia, provided it will be covered by a gutter metal edge or other material.

3.5.6 Protection

Elastomeric membrane underlayment shall not be left permanently exposed to sunlight. Membrane shall be covered with exposed roofing materials as soon as possible. Membrane damaged due to exposure to sunlight shall be patched prior to the application of final roof covering.

3.6 METAL FLASHING

Metal flashing shall be as shown at intersections of vertical or projecting surfaces through the roof or against which the roof abuts, such as walls, parapets, dormers, and sides of chimneys. Flashing installation shall be in accordance with Section 07600 SHEET METALWORK, GENERAL.

3.7 SLATING

3.7.1 Repair and Replacement

Existing reusable slates removed from the repair area shall be intermingled with new slates to provide a smooth visual transition between new and existing areas. Slating shall be applied as shown.

3.7.2 Slate Coursing

The slate shall project 2 inches at the eaves and 1 inch at gable ends, and shall be laid in horizontal courses with 3 inch headlap (unless otherwise indicated), and each course shall break joints with the preceding one by at least 3 inches. Slates at the eaves or cornice line shall be doubled and canted 1/4 inch by a wooden cant strip, using same thickness slate for under-eaves at first exposed course. Under-eave slate shall be approximately 3 inches longer than exposure of first course. There shall be no through joints from the roof surface to the underlayment.

3.7.3 Nailing

Each slate shall be fastened with a minimum of two copper nails of sufficient length to penetrate the roof decking at least 3/4 inch or through the decking thickness, whichever is less. Where the underside of roof decking is exposed to view, such as in overhanging eaves, the nails shall be long enough to penetrate the roof decking but not so long that they may be driven through the decking. The heads of slating nails shall just touch the slate and shall not be driven "home" or draw the slate, but

left with the heads just clearing the slate so that the slate hangs on the nail. Nails in slates overlapping sheet metalwork shall not puncture the sheet metal. Exposed nails are permissible only in top courses where unavoidable. Exposed nail heads shall be covered with elastic cement. Hip slates and ridge slates shall be laid in elastic cement spread thickly over unexposed surface of under courses of slate, nailed securely in place and pointed with elastic cement.

3.7.4 Vertical Surfaces

Slate shall be fitted neatly around pipes, ventilators, chimneys and other vertical surfaces.

3.7.5 Hips

Hips shall be laid to form a saddle hip as shown.

3.7.6 Ridges

Ridges shall be laid to form saddle ridges. The nails of the combing slate shall pass through the joints of the slate below. The combing slate shall be laid with the same exposure as the next course down. Combing slates sloping away from the direction of the prevailing storms shall project 1 inch above the combing slate on the opposite side of ridge.

3.7.7 Valleys

Valleys shall be laid to form open valleys.

3.8 ACCESSORIES FOR SLATE ROOFS

3.8.1 Crickets or Saddles

Vertical surfaces which project through the roof surface at a right angle to the slope of the roof shall have a cricket (sometimes referred to as a saddle) built into the roof to divert water away from the back of the vertical member, as shown. Crickets of light rafter construction covered with sheathing, underlayment, and copper sheet metal specified in Section 07600 SHEET METALWORK, GENERAL. If the cricket area is large and exposed to view, it shall be slated the same as other roof areas. Open-type valleys shall be formed with the main roof at cricket areas. The size of the cricket is largely determined by the roof condition. Unless noted otherwise, the slope of the cricket shall be the same as the slope of the roof.

-- End of Section --

SECTION 07311A

ROOFING, STRIP SHINGLES
08/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 226	(1997a) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 1970	(2000) Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D 3018	(1990; R 1994e1) Class A Asphalt Shingles Surfaced With Mineral Granules
ASTM D 3161	(1999a) Wind-Resistance of Asphalt Shingles (Fan-Induced Method)
ASTM D 3462	(1999) Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules
ASTM D 4869	(1988; R 1993e1) Asphalt-Saturated Organic Felt Shingle Underlayment Used in Roofing
ASTM E 108	(1999) Fire Tests of Roof Coverings

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA Shingle Manual	(1996) Asphalt Shingle Roofing Manual
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Application of Roofing Materials

Manufacturer's catalog data, description of underlayment, shingles, fasteners, ridge vents, and flashing. Manufacturer's instructions, annotated or supplemented by the Contractor to indicate configuration and method for installing the materials, and

for waterproofing of joints where flashings change direction. The number, spacing and orientation of fasteners shall be specified.

SD-04 Samples

Shingles; G

Full shingle sample and manufacturer's standard size samples of materials and products requiring color or finish selection.

1.3 DELIVERY AND STORAGE OF MATERIALS

Materials shall be delivered in manufacturer's unopened bundles and containers with the manufacturer's brand and name marked clearly thereon. Shingles shall be stored in accordance with manufacturer's printed instructions. Roll goods shall be stored on end in an upright position or in accordance with manufacturer's recommendations. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

1.4 WARRANTY

Provide manufacturer's warranty for a period of time of not less than twenty-five years.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the following requirements:

2.1.1 Metal Drip Edges

Metal drip edges shall be minimum 26 gauge galvanized steel or an equivalent non-corrosive non-staining material, as shown.

2.1.2 Underlayment

Organic felt; ASTM D 4869 or ASTM D 226, non perforated Type II, heavy-duty number 30.

2.1.3 Leak Barrier Underlayment

Self-adhering leak barrier or ice dam underlayment shall comply with ASTM D 1970 for sealability around nails.

2.1.4 Ventilators

2.1.4.1 Nailable Mesh Shingle Over Type Ridge Vents

Ridge vents shall be constructed of UV stabilized nailable polyester mesh material, approximately one foot wide. Vents shall be designed to prevent infiltration of insects, rain, and snow.

2.1.5 Nails

Nails shall be round head 11 or 12 gauge galvanized steel or equivalent corrosion resistant roofing nails. Nail heads shall be 3/8 inch minimum diameter, with flat and smooth low profile. Shanks shall be barbed or

otherwise deformed for added pull-out resistance. Nails shall be long enough to penetrate all layers of roofing materials and achieve secure anchorage into the roof deck. Nails shall extend through the underside of plywood roof decks.

2.1.6 Shingles

Shingles shall be approximately 12 by 36 inches in dimension and three-tab strip design. Shingles shall have self-sealing adhesive strips and shall meet a wind velocity rating of 60 mph plus or minus 5 percent in accordance with ASTM D 3161. Shingles shall be algae resistant. Glass felt shingles shall comply with ASTM D 3018 and ASTM D 3462 Type I (self-sealing), ASTM E 108 Class A (a light degree of fire protection), and shall weigh not less than 240 lbs..

2.2 COLOR

Shingle color shall be as indicated.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

The construction of any bay or section of roof decking shall be completed before roofing work is started. Roof surfaces shall be smooth, firm, dry, and free from loose boards, large cracks, and projecting ends that might damage the roofing. Vents and other projections through roofs shall be properly flashed and secured in position, and projecting nails shall be driven flush with the deck.

3.2 APPLICATION OF ROOFING MATERIALS

3.2.1 Flashings

Metal flashings shall conform to Section 07600A SHEET METALWORK, GENERAL. Metal flashings shall be provided at the intersections of roofs and adjoining walls and at projections through the deck such as chimneys and vent stacks. Valley flashing shall be of the woven type, in accordance with NRCA Shingle Manual.

3.2.2 Metal Drip Edges

Metal drip edges shall be provided along the eaves and rakes. The metal drip edge shall be applied directly over the underlayment along the rakes and directly on the wood deck at the eaves. Metal drip edges shall extend back from the edge of the deck not less than 3 inches and shall be secured with compatible nails spaced not more than 10 inches on center along the inner edge.

3.2.3 Underlayment

Before any shingles are applied, two layers of asphalt-saturated-felt underlayment shall be applied to the roof deck sheathing. In areas subject to ice damming, two plies of organic felt set in hot asphalt or asphalt lap cement, or an adhered polymer modified bitumen membrane underlayment shall be applied starting from the eaves to a point 24 inches inside the interior wall line.

3.2.4 Shingles

Shingles with the correct recommended exposure shall be applied in accordance with the manufacturer's printed instructions as they appear on the bundle wrapping.

-- End of Section --

SECTION 07600A

SHEET METALWORK, GENERAL

11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B 209	(2000) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2000) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 32	(1996) Solder Metal
ASTM B 370	(1998) Copper Sheet and Strip for Building Construction
ASTM D 226	(1997a) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 2822	(1991; R 1997e1) Asphalt Roof Cement
ASTM D 4022	(1994) Coal Tar Roof Cement, Asbestos Containing
ASTM D 4586	(1993; R 1999) Asphalt Roof Cement, Asbestos Free

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA Arch. Manual	(1993; Errata; Addenda Oct 1997) Architectural Sheet Metal Manual
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1.2 GENERAL REQUIREMENTS

Sheet metalwork shall be accomplished to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and shall allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Application of bituminous strip flashing over various sheet metal items is covered in Section 07510 BUILT-UP ROOFING. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit

continuous roofing operations. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in Section 15895.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Materials

Drawings of sheet metal items showing weights, gauges or thicknesses; types of materials; expansion-joint spacing; fabrication details; and installation procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, ventilated areas until immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

Lead, lead-coated metal, and galvanized steel shall not be used. Any metal listed by SMACNA Arch. Manual for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in SMACNA Arch. Manual. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items shall be copper.

2.1.1 Accessories

Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided.

2.1.2 Aluminum Extrusions

ASTM B 221, Alloy 6063, Temper T5.

2.1.3 Bituminous Cement

Type I asphalt cement conforming to ASTM D 2822 or ASTM D 4586. For coal tar roofing; coal tar cement conforming to ASTM D 4022.

2.1.4 Sealant

Unless otherwise specified, sealant shall be an elastomeric weather resistant sealant as specified in Section 07900 JOINT SEALING.

2.1.5 Fasteners

Fasteners shall be compatible with the fastened material and shall be the type best suited for the application.

2.1.6 Felt

ASTM D 226, Type I.

2.1.7 Aluminum Alloy Sheet and Plate

ASTM B 209, form, alloy, and temper appropriate for use.

2.1.8 Copper

ASTM B 370, Temper H 00.

2.1.9 Stainless Steel

ASTM A 167, Type 302 or 304; fully annealed, dead soft temper.

2.1.10 Solder

ASTM B 32, 95-5 tin-antimony.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Gutters and downspouts shall be designed and fabricated in conformance with SMACNA Arch. Manual; and as indicated. Unless otherwise specified or indicated, exposed edges shall be folded back to form a 1/2 inch hem on the concealed side, and bottom edges of exposed vertical surfaces shall be angled to form drips. Bituminous cement shall not be placed in contact with roofing membranes other than built-up roofing.

3.2 EXPANSION JOINTS

Expansion joints shall be provided as specified in SMACNA Arch. Manual. Expansion joints in continuous sheet metal shall be provided at 40 foot intervals for copper and stainless steel and at 32 foot intervals for aluminum, except extruded aluminum gravel stops and fascias which shall have expansion joints at not more than 12 foot spacing. Joints shall be evenly spaced. An additional joint shall be provided where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing.

3.3 PROTECTION OF ALUMINUM

Aluminum shall not be used where it will be in contact with copper or where it will contact water which flows over copper surfaces. Aluminum that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

3.3.1 Paint

Aluminum surfaces shall be solvent cleaned and given one coat of

zinc-molybdate primer and one coat of aluminum paint as specified in Section 09900 PAINTING, GENERAL.

3.3.2 Nonabsorptive Tape or Gasket

Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and cemented to the aluminum surface using a cement compatible with aluminum.

3.4 CONNECTIONS AND JOINTING

3.4.1 Soldering

Soldering shall apply to copper, and stainless steel items. Edges of sheet metal shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless steel to be pretinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

3.4.2 Riveting

Joints in aluminum sheets 0.040 inch or less in thickness shall be mechanically made.

3.4.3 Seaming

Flat-lock and soldered-lap seams shall finish not less than 1 inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.5 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 1/8 inch apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 12 inches on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

3.6 GUTTERS AND DOWNSPOUTS

Gutters and downspouts shall be installed as indicated. Gutters shall be supported as indicated. Downspouts shall be rigidly attached to the building. Supports for downspouts shall be spaced according to manufacturer's recommendations.

3.7 FLASHINGS

Flashings shall be installed at locations indicated and as specified below.

Sealing shall be according to the flashing manufacturer's recommendations.

Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls are specified in other sections. Except as otherwise indicated, counter flashings shall be provided over

base flashings. Perforations in flashings made by masonry anchors shall be covered up by an application of bituminous plastic cement at the perforation. Flashing shall be installed on top of joint reinforcement. Flashing shall be formed to direct water to the outside of the system.

3.7.1 Base Flashing

Metal base flashing shall be coordinated with roofing work. Metal base flashing shall be set in plastic bituminous cement over the roofing membrane, nailed to nailing strip, and secured in place on the roof side with nails spaced not more than 3 inches on centers. Metal base flashing shall not be used on built-up roofing.

3.7.2 Counter Flashings

Except as otherwise indicated, counter flashings shall be provided over base flashings. Counter flashing shall be installed as shown in SMACNA Arch. Manual. Where bituminous base flashings are provided, the counter flashing shall extend down as close as practicable to the top of the cant strip. Counter flashing shall be factory formed to provide spring action against the base flashing.

3.7.3 Stepped Flashing

Stepped flashing shall be installed where sloping roofs surfaced with shingles abut vertical surfaces. Separate pieces of base flashing shall be placed in alternate shingle courses.

3.7.4 Through-Wall Flashing

Through-wall flashing includes sill, lintel, and spandrel flashing. The flashing shall be laid with a layer of mortar above and below the flashing so that the total thickness of the two layers of the mortar and flashing are the same thickness as the regular mortar joints. Flashing shall not extend further into the masonry backup wall than the first mortar joint. Joints in flashing shall be lapped and sealed. Flashing shall be one piece for lintels and sills.

3.7.4.1 Lintel Flashing

Lintel flashing shall extend the full length of lintel. Flashing shall extend through the wall one masonry course above the lintels and shall be bent down over the vertical leg of the outer steel lintel angle not less than 2 inches, or shall be applied over top of masonry and precast concrete lintels. Bedjoints of lintels at control joints shall be underlaid with sheet metal bond breaker.

3.7.4.2 Sill Flashing

Sill flashing shall extend the full width of the sill and not less than 4 inches beyond ends of sill except at control joint where the flashing shall be terminated at the end of the sill.

3.7.5 Valley Flashing

Valley flashing shall be installed as specified in SMACNA Arch. Manual and as indicated.

3.8 GRAVEL STOPS AND FASCIA

Gravel stops and fascia shall be fabricated and installed as indicated and in accordance with SMACNA Arch. Manual.

3.9 INSTALLATION OF LOUVERS

Louvers shall be rigidly attached to the supporting construction. The installation shall be rain-tight. Louver screen shall be installed as indicated.

3.10 REGLETS

Reglets shall be a factory fabricated product of proven design, complete with fittings and special shapes as required. Open-type reglets shall be filled with fiberboard or other suitable separator to prevent crushing of the slot during installation. Reglet plugs shall be spaced not over 12 inches on centers and reglet grooves shall be filled with sealant. Friction or slot-type reglets shall have metal flashings inserted the full depth of slot and shall be lightly punched every 12 inches to crimp the reglet and counter flashing together. Polyvinyl chloride reglets shall be sealed with the manufacturer's recommended sealant.

3.11 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
- b. Verification of compliance of materials before, during, and after installation.
- c. Inspection of sheet metalwork for proper size and thickness, fastening and joining, and proper installation.

The actual quality control observations and inspections shall be documented and a copy of the documentation furnished to the Contracting Officer at the end of each day.

-- End of Section --

SECTION 07840A

FIRESTOPPING
08/00

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 84 (2000a) Surface Burning Characteristics of Building Materials

UNDERWRITERS LABORATORIES (UL)

UL 723 (1996; Rev thru Dec 1998) Test for Surface Burning Characteristics of Building Materials

UL Fire Resist Dir (1999) Fire Resistance Directory (2 Vol.)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping Materials.

Detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resist Dir or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgement, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal shall indicate the firestopping material to be provided for each type of application. When more than 5 penetrations or construction joints are to receive firestopping, drawings shall indicate location and type of application.

SD-07 Certificates

Firestopping Materials.

Certificates attesting that firestopping material complies with the specified requirements. In lieu of certificates, drawings showing UL classified materials as part of a tested assembly may be provided. Drawings showing evidence of testing by an alternate nationally recognized independent laboratory may be substituted.

Installer Qualifications.

Documentation of training and experience.

Inspection.

Manufacturer's representative certification stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.3 GENERAL REQUIREMENTS

Firestopping shall consist of furnishing and installing tested and listed firestop systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above.

1.4 STORAGE AND DELIVERY

Materials shall be delivered in the original unopened packages or containers showing name of the manufacturer and the brand name. Materials shall be stored off the ground and shall be protected from damage and exposure to elements. Damaged or deteriorated materials shall be removed from the site.

1.5 INSTALLER QUALIFICATIONS

The Contractor shall engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer qualification on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures.

1.6 COORDINATION

The specified work shall be coordinated with other trades. Firestopping materials, at penetrations of pipes and ducts, shall be applied prior to insulating, unless insulation meets requirements specified for firestopping. Firestopping materials at building joints and construction

gaps shall be applied prior to completion of enclosing walls or assemblies.

Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

Firestopping materials shall consist of commercially manufactured, asbestos-free products complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resist Dir or by a nationally recognized testing laboratory.

2.1.2 Toxicity

Material shall be nontoxic to humans at all stages of application.

2.1.3 Fire Resistance Rating

Firestopping will not be required to have a greater fire resistance rating than that of the assembly in which it is being placed.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement shall be sound and capable of supporting device.

3.2 INSTALLATION

Firestopping material shall completely fill void spaces regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Firestopping shall be installed in accordance with manufacturer's written instructions. Tested and listed firestop systems shall be provided in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls and partitions.
- b. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.
- c. Construction joints in floors and fire rated walls and partitions.

- d. Other locations where required to maintain fire resistance rating of the construction.

3.3 INSPECTION

Firestopped areas shall not be covered or enclosed until inspection is complete and approved. A manufacturer's representative shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements.

-- End of Section --

SECTION 07900A

JOINT SEALING
06/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 920	(1998) Elastomeric Joint Sealants
ASTM D 1056	(1998) Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1565	(1999) Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Backing.

Bond-Breaker.

Sealant.

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

SD-07 Certificates

Sealant.

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL REQUIREMENTS

The ambient temperature shall be within the limits of 40 to 90 degrees F when the sealants are applied.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time at the standard conditions for laboratory tests. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at temperatures between 40 and 90 degrees F unless otherwise specified by the manufacturer.

PART 2 PRODUCTS

2.1 BACKING

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated.

2.1.1 Rubber

Cellular rubber sponge backing shall be ASTM D 1056, Type 1, open cell, or Type 2, closed cell, Class A, round cross section.

2.1.2 PVC

Polyvinyl chloride (PVC) backing shall be ASTM D 1565, Grade VO 12, open-cell foam, round cross section.

2.1.3 Synthetic Rubber

Synthetic rubber backing shall be ASTM C 509, Option I, Type I preformed rods or tubes.

2.1.4 Neoprene

Neoprene backing shall be ASTM D 1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2.

2.2 BOND-BREAKER

Bond-breaker shall be as recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.3 PRIMER

Primer shall be non-staining type as recommended by sealant manufacturer for the application.

2.4 SEALANT

2.4.1 ELASTOMERIC

Elastomeric sealants shall conform to ASTM C 920 and the following:

- a. Polysulfide Sealant: Type S, Grade NS, Class 12.5, Use NT.
- b. Polyurethane sealant: Grade NS, Class 12.5, Use NT.
- c. Silicone sealant: Type S, Grade NS, Class 12.5, Use NT.

2.5 SOLVENTS AND CLEANING AGENTS

Solvents, cleaning agents, and accessory materials shall be provided as recommended by the manufacturer.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Surface Preparation

The surfaces of joints to receive sealant or caulk shall be free of all frost, condensation and moisture. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints to be in contact with the sealant. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

3.1.2 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

3.1.3 Steel Surfaces

Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

3.1.4 Aluminum Surfaces

Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

3.1.5 Wood Surfaces

Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

3.2 APPLICATION

3.2.1 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.2.2 Backing

Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

3.2.3 Bond-Breaker

Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.

3.2.4 Primer

Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.

3.2.5 Sealant

Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Joints shall be sealed as detailed in the drawings. Sealant shall be forced into joints with sufficient pressure to expel air and fill the groove solidly. Sealant shall be installed to the indicated depth without displacing the backing. Unless otherwise indicated, specified, or recommended by the manufacturer, the installed sealant shall be dry tooled to produce a uniformly smooth surface free of wrinkles and to ensure full adhesion to the sides of the joint; the use of solvents, soapy water, etc., will not be allowed. Sealants shall be installed free of air pockets, foreign embedded matter, ridges and sags. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.3 CLEANING

The surfaces adjoining the sealed joints shall be cleaned of smears and other soiling resulting from the sealant application as work progresses.

-- End of Section --

SECTION 08110

STEEL DOORS AND FRAMES

05/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- | | |
|-------------|--|
| ANSI A250.4 | (1994) Test Procedure and Acceptance
Criteria for Physical Endurance for Steel
Doors and Hardware Reinforcings |
| ANSI A250.6 | (1997) Hardware on Standard Steel Doors
(Reinforcement - Application) |
| ANSI A250.8 | (1998) SDI-100 Recommended Specifications
for Standard Steel Doors and Frames |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------------|--|
| ASTM A 591 | (1998) Steel Sheet, Electrolytic
Zinc-Coated, for Light Coating Mass
Applications |
| ASTM A 653/A 653M | (2000) Steel Sheet, Zinc-Coated
(Galvanized) or Zinc-Iron Alloy-Coated
(Galvannealed) by the Hot-Dip Process |
| ASTM A 924/A 924M | (1999) General Requirements for Steel
Sheet, Metallic-Coated by the Hot-Dip
Process |
| ASTM C 578 | (1995) Rigid, Cellular Polystyrene Thermal
Insulation |
| ASTM C 591 | (1994) Unfaced Preformed Rigid Cellular
Polyisocyanurate Thermal Insulation |
| ASTM C 612 | (1993) Mineral Fiber Block and Board
Thermal Insulation |
| ASTM D 2863 | (1997) Measuring the Minimum Oxygen
Concentration to Support Candle-Like
Combustion of Plastics (Oxygen Index) |

DOOR AND HARDWARE INSTITUTE (DHI)

- | | |
|----------|---|
| DHI A115 | (1991) Steel Door Preparation Standards |
|----------|---|

(Consisting of A115.1 through A115.6 and
A115.12 through A115.18)

HOLLOW METAL MANUFACTURERS ASSOCIATION (HMM)

HMM HMM (1992) Hollow Metal Manual

STEEL DOOR INSTITUTE (SDI)

SDI 105 (1998) Recommended Erection Instructions
for Steel Frames

SDI 111-F Recommended Existing Wall Anchors for
Standard Steel Doors and Frames

SDI 113 (1979) Apparent Thermal Performance of
STEEL DOOR and FRAME ASSEMBLIES

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal
Procedures."

SD-02 Shop Drawings

Doors

Frames

Accessories

Show elevations, construction details, metal gages, hardware
provisions, method of glazing, and installation details.

Schedule of doors

Schedule of frames

Submit door and frame locations.

SD-03 Product Data

Doors; G

Frames

Accessories

Submit manufacturer's descriptive literature for doors, frames, and
accessories. Include data and details on door construction, panel
(internal) reinforcement, insulation, and door edge construction.
When "custom hollow metal doors" are provided in lieu of "standard
steel doors," provide additional details and data sufficient for
comparison to ANSI A250.8 requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective

wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

ANSI A250.8, except as specified otherwise. Prepare doors to receive hardware specified in Section 08710, "Door Hardware." Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1 3/4 inches thick, unless otherwise indicated. Provide special heights as noted.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Heavy Duty Doors

ANSI A250.8, Level 2, physical performance Level B, Model 1, with core construction as required by the manufacturer for exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation.

2.2 CUSTOM HOLLOW METAL DOORS

Provide custom hollow metal doors where nonstandard steel doors are indicated. At the Contractor's option, custom hollow metal doors may be provided in lieu of standard steel doors. Door size(s), design, materials, construction, gages, and finish shall be as specified for standard steel doors and shall comply with the requirement of HMMA HMM. Fill all spaces in doors with insulation. Close top and bottom edges with steel channels not lighter than 16 gage. Close tops of exterior doors flush with an additional channel and seal to prevent water intrusion. Prepare doors to receive hardware specified in Section 08710, "Door Hardware." Undercut doors where indicated. Doors shall be 1 3/4 inches thick, unless otherwise indicated.

2.3 INSULATED STEEL DOOR SYSTEMS

At the option of the Contractor, insulated steel doors and frames may be provided in lieu of Grade I standard steel doors and frames. Door size(s), design, and material shall be as specified for standard steel doors. Insulated steel doors shall have a core of polyurethane foam and an R factor of 10.0 or more (based on a k value of 0.16); face sheets, edges, and frames of galvanized steel not lighter than 23 gage, 16 gage, and 16 gage respectively; magnetic weatherstripping; nonremovable-pin hinges; thermal-break aluminum threshold; and vinyl door bottom. Doors and frames shall receive phosphate treatment, rust-inhibitive primer, and baked acrylic enamel finish. Doors shall have been tested in accordance with ANSI A250.4 and shall have met the requirements for Level C. Prepare doors to receive hardware specified in Section 08710, "Door Hardware." Doors shall be 1 3/4 inches thick. Provide insulated steel doors and frames at entrances to dwelling units and where shown.

2.4 ACCESSORIES

2.4.1 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

2.5 INSULATION CORES

Insulated cores shall be of type specified, and provide an apparent U-factor of .48 in accordance with SDI 113 and shall conform to:

- a. Rigid Polyurethane Foam: ASTM C 591, Type 1 or 2, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D 2863; or
- b. Rigid Polystyrene Foam Board: ASTM C 578, Type I or II; or
- c. Mineral board: ASTM C 612, Type I.

2.6 STANDARD STEEL FRAMES

ANSI A250.8, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners. Provide steel frames for doors, unless otherwise indicated.

2.6.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

2.6.2 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inches on centers. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.6.3 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.6.3.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;
- b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to wood studs with nails;

- c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI 111-F; and

2.7 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in ANSI A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of ANSI A250.8 and ANSI A250.6. For additional requirements refer to DHI A115.

Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of ANSI A250.8, as applicable. Punch door frames to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.8 FINISHES

2.8.1 Factory-Primed Finish

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in ANSI A250.8, or paintable A25 galvanized steel without primer. Where coating is removed by welding, apply touchup of factory primer.

2.8.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior scheduled doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A 924/A 924M and ASTM A 653/A 653M. The Coating weight shall meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in ANSI A250.8.

2.8.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A 591, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in ANSI A250.8.

2.9 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. Frames for use in solid plaster partitions shall be welded construction.

2.9.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and

jamb seals.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI 105. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing. Backfill frames with mortar. When an additive is provided in the mortar, coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

3.1.2 Doors

Hang doors in accordance with clearances specified in ANSI A250.8. After erection and glazing, clean and adjust hardware.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08181

METAL STORM DOORS

08/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA 45 (1980) Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 603.8 (1992; Addendum 1993) Pigmented Organic Coatings on Extruded Aluminum

AAMA 606.1 (1976) Integral Color Anodic Finishes for Architectural Aluminum

AAMA 608.1 (1977) Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum

AAMA 1102.7 (1989) Aluminum Storm Doors

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 209 (1996) Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221 (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM C 920 (1998) Elastomeric Joint Sealants

ASTM C 1048 (1997; Rev. B) Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Storm doors

Show elevations of storm door units, full-size section, thicknesses and gages of material, finish and color, fastenings, methods of anchorage, size and spacing of anchors, method of glazing, locations of operating hardware, method and material for weatherstripping, method of attaching and operating both screen and glass insert panels, details of installation, and connections with

other work.

On storm door schedule, show location of each unit.

SD-03 Product Data

Storm doors

Hardware

Submit complete descriptive literature for each type of storm door and accessory.

SD-04 Samples

Storm doors

Submit one complete door unit of each type for approval. Label the sample for identification and, if approved, forward to the site. Samples in good condition may be installed if clearly identified and the locations are recorded. Do not remove identification and approval marks until final acceptance.

Storm door finishes; G

Submit for approval color range samples for color finishes. The actual finish shall be within the range represented by the approved samples.

SD-06 Test Reports

Storm doors

Submit test reports indicating that storm doors conform to applicable requirements of AAMA 1102.7 and requirements specified herein.

SD-10 Operation and Maintenance Data

Storm doors, Data Package 1

Submit operation and maintenance data in accordance with Section 01781, "Operation and Maintenance Data."

1.3 DELIVERY, STORAGE, AND HANDLING

Carefully pack products in poly bags or other protective containers. Deliver products to the project site in undamaged condition, store out of contact with the ground under weathertight covering, and protect against damage. Do not install damaged units. Replace damaged units with new units.

PART 2 PRODUCTS

2.1 MATERIALS

Metal storm doors shall be either aluminum or steel.

2.1.1 Wrought Aluminum, Sheet or Plate

ASTM B 209, Alloy 3000 or 5000 series.

2.1.1.2 Extruded Aluminum

ASTM B 221, Alloy 6063 or 6463, Temper T5 or T6.

2.1.1.3 Steel

Sections of the door shall be of roll formed tubular lock seam construction, consisting of 22 gage, hot-dipped galvanized steel.

2.1.1.4 Storm Doors

Conform to requirements of AAMA 1102.7, Specification CSD-C1, except as otherwise specified herein. Doors shall be self-storing, equal light, combination storm doors, fully assembled and prehung complete with glazing, insect screens, hardware, and weatherstripping ready for installation into prepared door openings. Dimensions indicated are nominal. Field measure openings to obtain exact dimensions needed for fabrication.

2.1.4.1 Hardware

For each storm door, provide a spring-loaded latch bolt operated by a turn knob, thumb piece, or lever handle; a tubular, adjustable, pneumatic or hydraulic closer; a chain door stop; and an adjustable sweep mounted on a bottom expander or with a flat metal retainer. Storm doors shall be lockable from the inside. Latch hardware, latch pin, knob, and springs shall be made from corrosion resistant materials.

2.1.4.2 Door Frames

Expander type, regular Z-bar, or New England Z-bar, as required to suit actual conditions at the door openings.

2.1.4.3 Door Stiles and Rails

Aluminum storm doors shall have extruded aluminum tubular sections not less than one inch deep by 2 1/4 inches face dimension, or 1 1/2 inches deep by 2 inches face dimension, and 0.050 inch nominal wall thickness. Steel storm doors shall have roll formed tubular lock seam steel sections with corners reinforced with 16 gage steel internal reinforcement and edge brazed.

2.1.4.4 Kick Plate

Kick plates for aluminum doors shall be not less than 3/16 inch thick extruded aluminum or 5/16 inch thick sandwich panel with sheet aluminum on both sides. Kick plates for steel doors shall be an embossed 18 gage galvanized steel panel. Panels shall be complete with vinyl splines and/or channel glazing stops with screws for installation.

2.1.4.5 Screen

Screen cloth shall be 16 by 18 mesh aluminum or fiberglass. Aluminum and fiberglass cloth screen inserts shall be held in place with removable, laid-in glazing splines.

2.1.5 Sealant

Elastomeric type, ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Sealant shall have been tested and approved for use with aluminum, steel, and wood.

2.2 COMPONENTS

2.2.1 Connections

Rigidly connect frames at corners to prevent racking during normal handling and installation.

2.2.2 Glass Inserts

Glaze inserts using either marine or drop-in glazing, provided that units withstand the uniform load test specified in AAMA 1102.7. Inserts for steel doors shall be of mitered joint construction and brazed at exterior corners. Glass shall be in accordance with ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, not less than 1/8 inch thick.

2.2.3 Locks

On inserts, locks shall engage round holes or deep notches in the main frame.

2.3 FINISHES

2.3.1 Aluminum

Exposed aluminum surfaces shall be factory finished with an anodic coating or organic coating. New storm doors shall have the same finish.

2.3.1.1 Anodic Coating

Exposed surfaces of aluminum extrusions and sheets shall be cleaned, and an anodized finish shall be applied conforming to AA 45. Finish shall be integral color anodized, designation AA-M10-C22-A32, Architectural Class II, AAMA 606.1, or electrolytically deposited color anodized, designation AA-M10-C22-A34, Architectural Class II, AAMA 608.1. Color shall be as indicated.

2.3.1.2 Organic Coating

Exposed surfaces of aluminum extrusions and sheets shall be thoroughly cleaned and primed, and a baked enamel finish shall be applied conforming to AAMA 603.8, with total dry film thickness not less than 0.8 mil. The finish color shall be as indicated.

2.3.2 Steel

Parts formed from hot-dipped galvanized steel shall be bonderized before and after assembly. After fabrication and assembly, materials shall be finished with a baked enamel finish. Color shall be as indicated.

PART 3 EXECUTION

3.1 PREPARATION

Thoroughly clean and repair surfaces to which storm door frames will be

applied.

3.2 INSTALLATION

Install square, in a true plane, level, plumb, in alignment with adjacent construction, and in accordance with manufacturer's printed directions.

3.2.1 Sealants

Make the entire perimeter of the main frame weathertight. Provide gaskets to separate new metal from existing metal.

3.2.2 Fastening

Attach units with panhead screws of adequate dimensions for the particular installation.

3.3 CLEANING

After installation, clean exposed surfaces to remove foreign matter and surface blemishes. Remove damaged units and units which cannot be cleaned satisfactorily and provide new units.

-- End of Section --

SECTION 08210

WOOD DOORS

09/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

NATIONAL WOOD WINDOW & DOOR ASSOCIATION (NWWDA)

NWWDA I.S.1-A (1993) Architectural Wood Flush Doors

NWWDA I.S.4 (1994) Water-Repellent Preservative
Non-Pressure Treatment for Millwork

NWWDA I.S.6 (1991) Wood Stile and Rail Doors

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Submit drawings or catalog data showing each type of door unit; descriptive data of head and jamb weatherstripping with installation instructions shall be included. Drawings and data shall indicate door type and construction, sizes, thickness and glazing.

SD-03 Product Data

Doors; G

Accessories

Water-resistant sealer

SD-04 Samples

Doors

Prior to the delivery of wood doors, submit a sample section of each type of door which shows the stile, rail, veneer, finish, and core construction.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inches thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until masonry work and plaster are dry. Replace defective or damaged doors with new ones.

1.4 WARRANTY

Warranty shall warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs indicated.

2.1.1 Stile and Rail Doors

Standard grade Ponderosa Pine doors or standard stile and rail doors conforming to NWWDA I.S.6. When laminated panels are furnished, they shall be not less than three ply. Flat panels shall have a minimum finished panel thickness of 1/2 inch. Raised panels shall have a minimum finished panel thickness of 3/4 inch.

2.1.2 Sliding Closet Doors

Paneled doors shall conform to NWWDA I.S.6 standard grade. Doors shall be 1 3/8 inch thick. Equip doors with the manufacturer's standard hardware.

2.2 ACCESSORIES

2.2.1 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Moldings on exterior doors shall have sloped surfaces. Glazing is specified in Section 08810A GLASS AND GLAZING.

2.3 FABRICATION

2.3.1 Marking

Each door shall bear a stamp, brand, or other identifying mark indicating quality and construction of the door.

2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based, identify the standard under which preservative treatment was made, and identify doors having a Type I glue bond.

2.3.3 Preservative Treatment

Exterior doors shall be water-repellent preservative treated and so marked at the plant in accordance with NWWDA I.S.4.

2.3.4 Adhesives and Bonds

NWWDA I.S.1-A. Use Type I bond for exterior doors and Type II bond for interior doors.

2.3.5 Prefitting

At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, bevelling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

2.3.6 Finishes

2.3.6.1 Field Painting

Factory prime or seal doors, and field paint as specified in Section 09900A PAINTING, GENERAL.

PART 3 EXECUTION

3.1 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inches. Door warp shall not exceed 1/4 inch when measured in accordance with NWWDA I.S.1-A.

-- End of Section --

SECTION 08361

SECTIONAL OVERHEAD DOORS

08/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997; Rev. A) Carbon Structural Steel
ASTM A 123/A 123M	(1997; Rev. A) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 227/A 227M	(1993) Steel Wire, Cold-Drawn for Mechanical Springs
ASTM A 229/A 229M	(1993) Steel Wire, Oil-Tempered for Mechanical Springs
ASTM A 653/A 653M	(1998) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 209	(1996) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C 236	(1989; R 1993) Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box

DOOR AND ACCESS SYSTEMS MANUFACTURERS ASSOCIATION (DASMA)

NAGDM 102	(1988) Sectional Overhead Type Doors
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1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Doors

Show types, sizes, locations, metal gages including minimum metal decimal thickness, hardware provisions, installation details, and other details of construction.

SD-03 Product Data

Doors

SD-08 Manufacturer's Instructions

Doors

SD-10 Operation and Maintenance Data

Doors

Submit Data Package 2 in accordance with Section 01781, "Operation and Maintenance Data."

1.3 DELIVERY, STORAGE, AND HANDLING

Protect doors and accessories from damage during delivery, storage, and handling. Clearly mark manufacturer's brand name. Store doors in dry locations with adequate ventilation, free from dust and water. Storage shall permit easy access for inspection and handling. Remove damaged items and provide new.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Hard-Drawn Springwire

ASTM A 227/A 227M.

2.1.2 Oil-Tempered Springwire

ASTM A 229/A 229M.

2.1.3 Steel Sheet

ASTM A 653/A 653M.

2.1.4 Steel Shapes

ASTM A 36/A 36M.

2.1.5 Aluminum Extrusions

ASTM B 221, Alloy 6063-T5.

2.1.6 Aluminum Sheets and Strips

ASTM B 209, alloy and temper best suited for the purpose.

2.2 DOORS

NAGDM 102. Residential doors. Metal doors shall be horizontal sections hinged together which operate in a system of tracks to completely close the door opening in the closed position and make the full width and height of the door opening available for use in the open position. Provide a permanent label on the door indicating the name and address of the manufacturer. Doors shall be of the low headroom type designed to slide up and back into a horizontal overhead position and requiring a maximum of 10

inches of headroom for 2 inch tracks and 12 inches of headroom for 3 inch tracks. Doors shall be operated by lifting handles.

2.3 FABRICATION

2.3.1 Steel Overhead Doors

Form door sections of hot-dipped galvanized steel not lighter than 20 gage with longitudinal integral reinforcing ribs. Sections shall be not less than 1-1/2 inches in thickness. Meeting rails shall have interlocking joints to ensure a weathertight closure and alignment for full width of the door. Sections shall be of the height indicated or the manufacturer's standard, except the height of an intermediate section shall not exceed 24 inches. Bottom sections may be varied to suit door height, but shall not exceed 30 inches in height.

2.3.1.1 Insulated Sections

Insulate door sections with fibrous glass or plastic foam to provide a "U" factor of 0.14 or less when tested in accordance with ASTM C 236. Cover interior of door sections with steel sheets of not lighter than 24 gage to completely enclose the insulating material.

2.3.1.2 Aluminum Sections

At the Contractor's option, door sections may be constructed of aluminum in lieu of steel. Aluminum sections shall, as a minimum, provide the same structural and thermal properties as specified for steel sections.

2.3.2 Aluminum Panel Overhead Doors

Door sections shall be of panel construction with extruded aluminum stiles and rails with aluminum panels. Stiles and rails shall have a minimum wall thickness of 0.060 inch. Meeting rails shall have interlocking joints to ensure a weathertight closure and alignment for full width of door. Sections shall be of the height indicated or the manufacturer's standard, but the height of an intermediate section shall not exceed 24 inches. Bottom sections may be varied to suit door height, but shall not exceed 30 inches in height. Aluminum panels shall be not less than 0.040 inch in thickness. Install panel using a continuous vinyl gasket and snap-in type of aluminum or vinyl glazing bead.

2.3.3 Tracks

Provide galvanized steel tracks not lighter than 14 gage for 2 inch tracks and not lighter than 12 gage for 3 inch tracks. Provide vertical tracks with continuous steel angle not lighter than 13 gage for installation to walls. Incline vertical track through use of adjustable brackets to obtain a weathertight closure at jambs. Reinforce horizontal track with galvanized steel angle; support from track ceiling construction with galvanized steel angle and cross bracing to provide a rigid installation.

2.3.4 Hardware

Provide hinges, brackets, rollers, locking devices, and other hardware required for complete installation. Roller brackets and hinges shall be 14 gage galvanized steel. Rollers shall have ball bearings and case-hardened races. Provide reinforcing on doors where roller hinges are connected. Provide a positive locking device and cylinder lock with two keys on

manually operated doors.

2.3.5 Counterbalancing

Counterbalance doors with an oil-tempered, helical-wound torsional spring mounted on a steel shaft. Spring tension shall be adjustable; connect spring to doors with cable through cable drums. Cable safety factor shall be at least 7 to 1.

2.4 MANUAL OPERATORS

2.4.1 Pushup Operators

Provide lifting handles on both sides of door. The force required to operate the door shall not exceed 25 pounds. Provide pulldown straps or ropes at bottom of doors over 7 feet high.

2.5 WEATHER SEALS

Provide exterior doors with weatherproof joints between sections by means of tongue-and-groove joints, rabbetted joints, shiplap joints, or wool pile, vinyl or rubber weatherstripping; a rubber, wool pile, or vinyl, adjustable weatherstrip at the top and jambs; and a compressible neoprene, rubber, wool pile, or vinyl weather seal attached to the bottom of the door.

2.6 FINISHES

Concealed ferrous metal surfaces and tracks shall be hot-dip galvanized. Other ferrous metal surfaces, except rollers and lock components, shall be hot-dip galvanized and shop primed.

2.6.1 Galvanized and Shop Primed

Surfaces specified shall have a zinc coating, a phosphate treatment, and a shop prime coat of rust-inhibitive paint. The galvanized coating shall conform to ASTM A 653/A 653M, coating designation G60, for steel sheets, and ASTM A 123/A 123M for assembled steel products. The weight of coatings for assembled products shall be as designated in Table I of ASTM A 123/A 123M for the class of material to be coated. The prime coat shall be a type especially developed for materials treated by phosphates and adapted to application by dipping or spraying. Repair damaged zinc-coated surfaces with galvanizing repair paint and spot prime. At the Contractor's option, a two-part system including bonderizing, baked-on epoxy primer, and baked-on enamel topcoat may be applied in lieu of prime coat specified.

2.6.2 Aluminum

Exposed surfaces shall receive a pretreatment and a baked-on enamel finish to match base standard "Langley Brown" color.

PART 3 EXECUTION

3.1 INSTALLATION

Install doors in accordance with approved shop drawings and manufacturer's instructions. Upon completion, doors shall be weathertight and free from warp, twist, or distortion. Lubricate and adjust doors to operate freely.

3.2 TESTING

After installation is complete, operate doors to demonstrate installation and function of operators, safety features, and controls. Correct deficiencies.

-- End of Section --

SECTION 08520A

ALUMINUM WINDOWS

03/00

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

- | | |
|----------|--|
| AAMA 101 | (1997) Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors |
| AAMA 605 | (1998) voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------------|--|
| ASTM E 283 | (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen |
| ASTM E 330 | (1997e1) Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference |
| ASTM E 331 | (1996) Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference |

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

- | | |
|----------|--|
| NFRC 100 | (1997) Procedure for Determining Fenestration Product U-factors |
| NFRC 200 | (1997) Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence |

1.2 WINDOW PERFORMANCE

Aluminum windows shall meet the following performance requirements. Testing requirements shall be performed by an independent testing laboratory or agency.

1.2.1 Structural Performance

Structural test pressures on window units shall be for positive load (inward) and negative load (outward) in accordance with ASTM E 330. After testing, there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There shall be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established by AAMA 101 for the window types and classification specified in this section.

1.2.2 Air Infiltration

Air infiltration shall not exceed the amount established by AAMA 101 for each window type when tested in accordance with ASTM E 283.

1.2.3 Water Penetration

Water penetration shall not exceed the amount established by AAMA 101 for each window type when tested in accordance with ASTM E 331.

1.2.4 Thermal Performance

Thermal transmittance for thermally broken aluminum windows with insulating glass shall not exceed a U-factor of $0.75 \text{ Btu/hr-ft}^2\text{-F}$ determined according to NFRC 100, and a solar heat gain coefficient (SHGC) of $0.40 \text{ Btu/hr-ft}^2\text{-F}$ determined according to NFRC 200. Window units shall comply with the U.S. Department of Energy, Energy Star Window Program for the Southern Climate Zone.

1.2.5 Condensation Index Rating

The condensation index rating shall be not less than 85 as determined using NFRC approved software THERM.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Aluminum Windows

Drawings indicating elevations of window, rough-opening dimensions for each type and size of window, full-size sections, thicknesses of metal, fastenings, methods of installation and anchorage, connections with other work, type of wall construction, size and spacing of anchors, method of glazing, mullion details, weatherstripping details, and window schedules showing locations of each window type.

SD-03 Product Data

Aluminum Windows

Manufacturer's descriptive data and catalog cut sheets.

Manufacturer's preprinted installation instructions and cleaning instructions.

SD-04 Samples

Aluminum Windows

Manufacturer's standard color samples of the specified finishes.

SD-06 Test Reports

Aluminum Windows

Reports for each type of aluminum window attesting that identical windows have been tested and meet all performance requirements established under paragraph WINDOW PERFORMANCE.

SD-07 Certificates

Aluminum Windows

Certificates stating that the aluminum windows are AAMA certified conforming to requirements of this section. Labels or markings permanently affixed to the window will be accepted in lieu of certificates. Product ratings determined using NFRC 100 and NFRC 200 shall be authorized for certification and properly labeled by the manufacturer.

1.4 QUALIFICATION

Window manufacturer shall specialize in designing and manufacturing the type of aluminum windows specified in this section, and shall have a minimum of 5 years of documented successful experience. Manufacturer shall have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.5 DELIVERY AND STORAGE

Aluminum windows shall be delivered to project site and stored in accordance with manufacturer's recommendations. Damaged windows shall be replaced with new windows.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 PRODUCTS

2.1 ALUMINUM WINDOWS

2.1.1 Fixed Windows

Aluminum fixed (F) windows shall conform to AAMA 101 F-HC40 type, non-operable glazed frame, complete with provisions for reglazing in the field. Custom size windows shall be provided for existing openings.

2.2 WEATHERSTRIPPING

Weatherstripping for ventilating sections shall be of type designed to meet water penetration and air infiltration requirements specified in this section in accordance with AAMA 101, and shall be manufactured of material compatible with aluminum and resistant to weather. Weatherstrips shall be factory-applied and easily replaced in the field. Neoprene or polyvinylchloride weatherstripping are not acceptable where exposed to direct sunlight.

2.3 ACCESSORIES

2.3.1 Fasteners

Fastening devices shall be window manufacturer's standard design made from aluminum, stainless steel, cadmium-plated steel, nickel/chrome-plated steel in compliance with AAMA 101. Self-tapping sheet metal screws will not be acceptable for material thicker than 1/16 inch.

2.3.2 Hardware

Hardware shall be as specified for each window type and shall be fabricated of aluminum, stainless steel, cadmium-plated steel, zinc-plated steel or nickel/chrome-plated steel in accordance with requirements established by AAMA 101.

2.3.3 Window Anchors

Anchoring devices for installing windows shall be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA 101.

2.4 GLASS AND GLAZING

Aluminum windows shall be designed for inside glazing, field glazing, and for glass types scheduled on drawings and specified in Section 08810A GLASS AND GLAZING. Units shall be complete with glass and glazing provisions to meet AAMA 101. Glazing material shall be compatible with aluminum, and shall not require painting.

2.5 FINISH

2.5.1 High-Performance Coating

Exposed surfaces of aluminum windows shall be finished with a two-coat fluoropolymer coating system containing at least 70 percent by weight polyvinylidene fluoride, PVF2 resin, factory-applied, oven-baked, conforming to AAMA 605, with a primer coat of 0.20 to 0.30 mils and a color coat of minimum 1.0 mil, total dry film thickness of 1.20 to 1.3 mils. Finish shall be free of scratches and other blemishes.

2.5.2 Color

Color shall be as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Aluminum windows shall be installed in accordance with approved shop

drawings and manufacturer's published instructions. Aluminum surfaces in contact with masonry, concrete, wood and dissimilar metals other than stainless steel, zinc, cadmium or small areas of white bronze, shall be protected from direct contact using protective materials recommended by AAMA 101. The completed window installation shall be watertight in accordance with Section 07900A JOINT SEALING. Glass and glazing shall be installed in accordance with requirements of this section and Section 08810A GLASS AND GLAZING.

3.2 CLEANING

3.2.1 Cleaning

Aluminum window finish and glass shall be cleaned on exterior and interior sides in accordance with window manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid scratching or marring window finish and glass surfaces.

-- End of Section --

SECTION 08550

WOOD WINDOWS

08/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 101 (1997) Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

AAMA 605.2 (1995; Addendum 1995) High Performance Organic Coatings on Architectural Extrusions and Panels

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3656 (1997) Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

NWWDA I.S. 4 (1994) Water-Repellent Preservative Non-Pressure Treatment for Millwork

SCREEN MANUFACTURERS ASSOCIATION (SMA)

SMA 1004 (1987) Aluminum Tubular Frame Screens for Windows

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Wood windows

Indicate elevations of units, full-size sections, fastenings, methods of installation and anchorage, method of glazing, locations of operating hardware, mullion details, method and material for weatherstripping, bar and muntin layouts, method of attaching insect screens and storm windows, details of installation, and connections with other work.

SD-03 Product Data

Wood windows

SD-08 Manufacturer's Instructions

Wood windows

Submit manufacturer's written instructions for installation.

SD-10 Operation and Maintenance Data

Wood windows, Data Package 1

Submit data package in accordance with Section 01781, "Operation and Maintenance Data."

1.3 DELIVERY AND STORAGE

Deliver windows to site in sealed undamaged cartons or in palletized multiple units. Protect from damage, dampness and extreme temperature or humidity changes. Store under cover in well-ventilated enclosed space. Do not store in a building under construction until concrete, masonry, and plaster are dry. Replace defective or damaged windows.

1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided. In addition, provide 20 year full warranty against seal failure on the insulated glass. Provide 10 year warranty on all parts.

1.5 LEVEL OF QUALITY

Manufacturer's names and series are included in these specifications to clearly establish the level of quality which shall be provided. Windows shall comply with all requirements in these specifications and shall be equal to the windows which are indicated by manufacturer's names and series.

PART 2 PRODUCTS

2.1 WOOD WINDOWS

Wood windows shall consist of complete units including sash, glass, frame, weatherstripping, insect screen, and hardware. Window units shall meet the DP40 requirements of AAMA 101, except maximum air infiltration shall not exceed 0.34 CFM per linear foot of sash crack when tested under uniform static air pressure difference of 1.57 psf. In addition to general hardware requirements of AAMA 101, provide hardware for various window types as indicated below. Glass and glazing materials shall conform to Section 08800N, "Glazing."

2.1.1 Single-Hung and Double-Hung Windows

Provide with one sash fastener and two sash lifts, except provide one sash lift when window is fitted with a balance that counterbalances weight of sash.

2.1.2 Stationary Windows

Provide fixed sash and basic frame in accordance with AAMA 101.

2.1.3 Acceptable Manufacturers

Aluminum clad wood windows shall be one of the three manufacturers listed hereinafter:

- a. Eagle Clad series as manufactured by Eagle Window and Door Inc.; an American Architectural Products Corporation Company.
- b. Legacy series as manufactured by Weathershield Manufacturing, Inc.
- c. Clad Ultimate series as manufactured by Marvin Windows and Doors.

2.2 FINISHES

2.2.1 Paint

Furnish windows with factory-primed surfaces which will be exempt from first paint coat application required in Section 09900, "Paints and Coatings."

2.2.2 Aluminum Cladding

Preservative treat all basic wood frame and sash members in accordance with NWWDA I.S. 4, except do not use pentachlorophenol. Clad all exterior surfaces with or extruded aluminum with joints sealed during assembly. Aluminum clad frames and sash shall meet performance requirements of AAMA 101.

2.2.2.1 Aluminum Finish

Factory finish with organic coating.

2.2.2.2 Organic Coating

Clean and prime exposed aluminum surfaces. Provide high performance finish in accordance with AAMA 605.2 with total dry film thickness of not less than 1.2 mils. Finish color as indicated.

2.3 INSECT SCREENS

ASTM D 3656, Class 2, 18 by 14 mesh, color as indicated. Aluminum frames to meet SMA 1004. Frame color shall be white.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wood and Wood Clad Windows

Install in accordance with the approved installation instructions. Securely anchor windows in place.

3.1.2 Insect Screen

Install screen panels in accord with manufacturer's instructions. Install aluminum framed screens in accord with SMA 1004.

3.2 ADJUSTMENTS

Make final adjustment for proper operation of ventilating unit after glazing. Make adjustments to operating sash or ventilators to assure

smooth operation. Units shall be weathertight when locked closed.

3.3 CLEANING

Clean windows on both exterior and interior in accordance with manufacturer's recommendations.

-- End of Section --

SECTION 08710

DOOR HARDWARE

02/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 283 (1991) Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM F 883 (1990) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.1 (1997) Butts and Hinges (BHMA 101)

BHMA A156.2 (1996) Bored and Preassembled Locks and Latches (BHMA 601)

BHMA A156.3 (1994) Exit Devices (BHMA 701)

BHMA A156.6 (1994) Architectural Door Trim (BHMA 1001)

BHMA A156.7 (1988) Template Hinge Dimensions

BHMA A156.13 (1994) Mortise Locks & Latches (BHMA 621)

BHMA A156.16 (1997) Auxiliary Hardware

BHMA A156.18 (1993) Materials and Finishes (BHMA 1301)

BHMA A156.21 (1996) Thresholds

BHMA A156.22 (1996) Door Gasketing Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (1999) Fire Doors and Fire Windows

NFPA 101 (1997) Life Safety Code

STEEL DOOR INSTITUTE (SDOI)

SDI 100 (1991) Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL BMD

(1999) Building Materials Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Hardware schedule

Keying system

SD-03 Product Data

Hardware items; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule items, Data Package 1

Submit data package in accordance with Section 01781, "Operation and Maintenance Data."

SD-11 Closeout Submittals

Key bitting

1.3 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hard-ware Item	Quan- tity	Size	Reference Publi- cation Type No.	Finish	Mfr. Name and Catalog No.	Key Con- trol Symbols	UL Mark (If fire rated and listed)	BHMA Finish Designa- tion
-----	-----	-----	-----	-----	-----	-----	-----	-----

1.4 KEY BITTING CHART REQUIREMENTS

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

- Complete listing of all keys (AA1, AA2, etc.).
- Complete listing of all key cuts (AA1-123456, AA2-123458).
- Tabulation showing which key fits which door.
- Copy of floor plan showing doors and door numbers.
- Listing of 20 percent more key cuts than are presently required in each master system.

1.5 QUALITY ASSURANCE

1.5.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown in hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware to be applied to metal or to prefinished doors shall be made to template. Promptly furnish template information or templates to door and frame manufacturers. Template hinges shall conform to BHMA A156.7. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 80 for fire doors and NFPA 101 for exit doors, as well as to other requirements specified, even if such hardware is not specifically mentioned under paragraph entitled "Hardware Schedule." Such hardware shall bear the label of Underwriters Laboratories, Inc., and be listed in UL BMD or labeled and listed by another testing laboratory acceptable to the Contracting Officer.

2.3 HARDWARE ITEMS

Hinges, pivots, locks, latches, exit devices, bolts, and closers shall be clearly and permanently marked with the manufacturer's name or trademark where it will be visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

2.3.1 Hinges

BHMA A156.1, 4 1/2 by 4 1/2 inches unless otherwise specified. Construct loose pin hinges for exterior doors and reverse-bevel interior doors so that pins will be nonremovable when door is closed. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges.

2.3.2 Locks and Latches

2.3.2.1 Residential Bored Locks and Latches

BHMA A156.2, Series 4000, Grade 2. Locks for exterior doors shall have threaded roses or concealed machine screws.

2.3.3 Cylinders and Cores

Provide cylinders for new locks, including locks provided under other sections of this specification. Cylinders shall be fully compatible with

products of the Best Lock Corporation and shall have interchangeable cores which are removable by a special control key. The cores shall have seven pin tumblers and shall be factory set using the A4 system and F keyway. Submit a core code sheet with the cores. The cores shall be master keyed in one system for this project. Provide construction interchangeable cores.

2.3.4 Keying System

The Government will provide permanent cylinders with cores and keys for mortise locksets, auxiliary locks, and exit devices. Cylinders shall be as manufactured by Best Lock Corp., Arrow Lock Corp., or Falcon Lock. The Contractor shall give written notice 90 days prior to the required delivery of the cylinders. Temporary cores and keys for the Contractor's use during construction, and for testing the locksets, shall be provided by the Contractor.

2.3.5 Lock Trim

Cast, forged, or heavy wrought construction and commercial plain design.

2.3.5.1 Knobs and Roses

In addition to meeting test requirements of BHMA A156.2 and BHMA A156.13, knobs, roses, and escutcheons shall be 0.050 inch thick if unreinforced. If reinforced, outer shell shall be 0.035 inch thick and combined thickness shall be 0.070 inch, except knob shanks shall be 0.060 inch thick.

2.3.5.2 Lever Handles

Provide lever handles in lieu of knobs where specified in paragraph entitled "Hardware Schedule". Lever handles for exit devices shall meet the test requirements of BHMA A156.13 for mortise locks. Lever handle locks shall have a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when a force in excess of that specified in BHMA A156.13 is applied to the lever handle. Lever handles shall return to within 1/2 inch of the door face.

2.3.6 Door Bolts

BHMA A156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts: BHMA A156.3, Type 25.

2.3.7 Door Protection Plates

BHMA A156.6.

2.3.7.1 Sizes of Kick Plates

Width for single doors shall be 2 inches less than door width; width for pairs of doors shall be one inch less than door width. Height of kick plates shall be 8 inches for flush doors and one inch less than height of bottom rail for panel doors. Height of mop plates shall be 6 inches.

2.3.8 Door Stops and Silencers

BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.9 Padlocks

ASTM F 883.

2.3.10 Thresholds

BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.11 Weather Stripping Gasketing

BHMA A156.22. Provide the type and function designation where specified in paragraph entitled "Hardware Schedule". A set shall include head and jamb seals, sweep strips, and for pairs of doors, astragals. Air leakage of weather stripped doors shall not exceed 0.5 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E 283. Weather stripping shall be one of the following:

2.3.11.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Aluminum shall be clear (natural) anodized.

2.3.11.2 Interlocking Type

Zinc or bronze not less than 0.018 inch thick.

2.3.11.3 Spring Tension Type

Spring bronze or stainless steel not less than 0.008 inch thick.

2.3.12 Rain Drips

Extruded aluminum, not less than 0.08 inch thick, clear anodized. Set drips in sealant conforming to Section 07920N, "Joint Sealants," and fasten with stainless steel screws.

2.3.12.1 Door Rain Drips

Approximately 1 1/2 inches high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.12.2 Overhead Rain Drips

Approximately 1 1/2 inches high by 2 1/2 inches projection, with length equal to overall width of door frame. Align bottom with door frame rabbet.

2.3.13 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Fasteners exposed to weather shall be of nonferrous metal or stainless steel. Provide fasteners of type necessary to accomplish a permanent installation.

2.5 FINISHES

Hardware for aluminum doors shall be finished to match the doors.

BHMA A156.18. Hardware shall have BHMA 612 finish (satin bronze), unless specified otherwise. Surface door closers shall have bronze paint finish. Steel hinges shall have BHMA 639 finish (satin bronze plated). Exposed parts of concealed closers shall have finish to match lock and door trim. Hardware for aluminum doors shall be finished to match the doors. Hardware showing on interior of bathrooms, shower rooms, toilet rooms, and washrooms shall have BHMA 625 finish (bright chromium plated).

PART 3 EXECUTION

3.1 INSTALLATION

Install hardware in accordance with manufacturers' printed instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weather Stripping Installation

Handle and install weather stripping so as to prevent damage. Provide full contact, weather-tight seals. Doors shall operate without binding.

3.1.1.1 Stop-Applied Weather Stripping

Fasten in place with color-matched sheet metal screws not more than 9 inches o.c. after doors and frames have been finish painted.

3.1.1.2 Interlocking Type Weather Stripping

Provide interlocking, self-adjusting type on heads and jambs and flexible hook type at sills. Nail weather stripping to door one inch o.c. and to heads and jambs at 4 inches o.c.

3.1.1.3 Spring Tension Type Weather Stripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze, stainless steel nails with stainless steel. Space nails not more than 1 1/2 inches o.c.

3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves.

3.2 HARDWARE LOCATIONS

SDI 100, unless indicated or specified otherwise.

- a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.

b. Mop Plates: Bottom flush with bottom of door.

3.3 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, as directed, errors in cutting and fitting and damage to adjoining work.

3.4 HARDWARE SETS

GOQ - SINGLE

HW-1 (Door 100)

Refinish Existing Hardware

HW-2 (Doors 110A, 110B, 111)

3 ea. Hinges	A8133, 600
1 ea. Mortise Lockset	Series 4000, Grade 2, F13, 605
See Picture # 1 for Trim Design Trim Must Match Existing	
1 ea. Stop	L02031, 605
1 set Weatherstrip	R0K154
1 ea. Sweep	R0K534, 605

HW-3 (Doors 101, 204, 206)

3 ea. Hinges	A8133, 600
1 ea. Latch Set	Series 4000, Grade 2, F75-2, 605/625
Outside Trim shall Match Picture # 1 Inside Trim shall be Egg Shaped	
1 ea. Stop	L02031

HW-4 (Doors 201, 202, 202A, 203, 205, 208)

3 ea. Hinges	A8133, 600
1 ea. Latch Set	Series 4000, Grade 2, F75-2, 605
Trim shall Match Picture # 1	
1 ea. Stop	L02031
1 set Weatherstripping @ Door 205	

HW-5 (Doors 103, 104, 105, 202B, 205A, 207)

3 ea. Hinges	A8133, 600
1 ea. Latch Set	Series 4000, Grade 2, F75-2, 605
Trim Will Match Picture # 1	
1 ea. Stop	L02031

HW-6 (Doors 103A, 300, 301)

3 ea. Hinges A8133, 600
1 ea. Latch Set Series 4000, Grade 2, F75-2, 605
Trim shall Match Picture # 1
1 ea. Stop L02031

HW-7 (Door 106)

1 set Spring Pivots K82183, 605
2 ea. Push Plates J301, 605
2 ea. Kickplates J102, 605
2 ea. Stops L02031, 605

HW-8 (Door 110)

2 set Spring Pivots K82183, 605
4 ea. Push Plates J301, 605
4 ea. Kickplates J102, 605
4 ea. Stops L02031, 605

HW-9 (Doors 201A, 203A, 203B, 208A)

6 ea. Hinges A8133, 600
1 ea. Magnetic Catch E09011, 605
2 ea. Dummy Trim Match Picture #1, 605

HW-10 (Door 102)

1 set Pocket Door Hardware D8671
1 ea. Edge Pull D2801, 605
2 ea. Flush Pulls D0781, 606

GOQ - DUPLEX

HW-1 (Door 100)

Refinish Existing Hardware

HW-2 (Doors 001, 004, 105)

3 ea. Hinges A8133, 600
1 ea. Mortise Lock Set Series 4000, Grade 2, F82, 605
See Picture # 1 for Trim Design Trim Must Match Existing
1 ea. Stop L02031, 605
1 set Weatherstrip R0K154
1 ea. Sweep R0K534, 605
1 ea. Threshold J32100

HW-3 (Doors 104, 203, 207)

3 ea. Hinges A8133, 600
1 ea. Latch Set Series 4000, Grade 2, F76-2, 605/625
Outside Trim shall Match Picture # 1 Inside Trim shall be Egg Shaped

1 ea. Stop L02031

HW-4 (Door 202A)

3 ea. Hinges A8133, 600
1 ea. Latch Set Series 4000, Grade 2, F75-2, 605
Trim will match Picture #1
1 ea. Stop L02031

HW-5 (Doors 201, 202, 206)

3 ea. Hinges A8133, 600
1 ea. Latch Set Series 4000, Grade 2, F76-2, 605
Trim shall Match Picture # 1
1 ea. Stop L02031

HW-6 (Doors 101, 105A, 208)

3 ea. Hinges A8133, 600
1 ea. Latch Set Series 4000, Grade 2, F75-2, 605
Trim shall Match Picture # 1
1 ea. Stop L02031

HW-7 (Doors 105B, 300)

3 ea. Hinges A8133, 600
1 ea. Latch Set Series 4000, Grade 2, F75-2, 605
Trim shall Match Picture # 1
1 ea. Stop L02031

HW-8 (Door 103)

1 set Pocket Door Hardware D8671
1 ea. Edge Pull D2801, 605
2 ea. Flush Pulls D0781, 606

HW-9 (Doors 201B, 204)

6 ea. Hinges A8133, 600
1 ea. Magnetic Catch E09011, 605
2 ea. Dummy Trim 605
2 ea. Stop L02031

HW-10 (Door 103A)

1 set Spring Pivots K82183, 605
2 ea. Push Plates J301, 605
2 ea. Kickplates J102, 605
2 ea. Stops L02031, 605

ENLISTED

HW-1 (Door 101)

Refinish Existing Hardware

HW-2 (Doors 001, 109)

3 ea. Hinges	A8133, 600
1 ea. Cylindrical Lock Set	Series 4000, Grade 2, F82, 605
1 ea. Stop	L02031, 605
1 set Weatherstrip	R0K154
1 ea. Sweep	R0K534, 605
1 ea. Threshold	J32100

HW-3 (Doors 105, 201, 202, 203, 204, 205, 206)

3 ea. Hinges	A8133, 600
1 ea. Latch Set	Series 4000, Grade 2, F76-2, 605
Trim shall Match Picture # 1	
1 ea. Stop	L02031

HW-4 (Doors 107, 205A)

3 ea. Hinges	A8133, 600
1 ea. Latch Set	Series 4000, Grade 2, F75-2, 605
Trim Will Match Picture # 1	
1 ea. Stop	L02031

HW-5 (Door 101A, 110)

3 ea. Hinges	A8133, 600
1 ea. Latch Set	Series 4000, Grade 2, F75-2, 605
Trim Will Match Picture # 1	
1 ea. Stop	L02031

HW-6 (Doors 202A)

6 ea. Hinges	A8133, 600
1 ea. Magnetic Catch	E09011, 605
2 ea. Dummy Trim	Match Picture #1, 605
2 ea. Stop	L02031

HW-7 (Door 100)

All Hardware By Door Supplier

HW-8 (Door 201A)

1 set Bi-Parting Door Hardware	D8731
2 ea. Flush Pulls	D0781, 605

-- End of Section --

SECTION 08810A

GLASS AND GLAZING
05/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (1984; R 1994) Safety Performance
Specifications and Methods of Test for
Safety Glazing Materials Used in Buildings

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509 (1994) Elastomeric Cellular Preformed
Gasket and Sealing Material

ASTM C 669 (1995) Glazing Compounds for Back Bedding
and Face Glazing of Metal Sash

ASTM C 864 (1999) Dense Elastomeric Compression Seal
Gaskets, Setting Blocks, and Spacers

ASTM C 920 (1998) Elastomeric Joint Sealants

ASTM C 1036 (1991; R 1997) Flat Glass

ASTM C 1048 (1997; Rev. B) Heat-Treated Flat Glass -
Kind HS, Kind FT Coated and Uncoated Glass

ASTM D 395 (1998) Rubber Property - Compression Set

ASTM E 773 (1997) Accelerated Weathering of Sealed
Insulating Glass Units

ASTM E 774 (1997) Classification of the Durability of
Sealed Insulating Glass Units

ASTM E 1300 (1998) Determining the Minimum Thickness
and Type of Glass Required to Resist a
Specified Load

COMMERCIAL ITEM DESCRIPTION (CID)

CID A-A-378 (Basic) Putty Linseed Oil Type, (for
Wood-Sash-Glazing)

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(1997) Glazing Manual
GANA Standards Manual	(1995) Engineering Standards Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

SD-03 Product Data

Glass Glazing Accessories

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

SD-04 Samples

Glass

Two 8 x 10 inch samples of each of the following: tinted glass, patterned glass, and insulating glass units.

SD-07 Certificates

Glass

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

1.3 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work. Glazed panels shall comply with the safety standards, as indicated in accordance with ANSI Z97.1. Glazed panels shall comply with indicated wind/snow loading in accordance with ASTM E 1300.

1.4 DELIVERY, STORAGE AND HANDLING

Glazing compounds shall be delivered to the site in the manufacturer's unopened containers. Glass shall be stored indoors in a safe, well ventilated dry location in accordance with manufacturer's instructions, and shall not be unpacked until needed for installation. Glass shall not be

stored on site over 1 month.

1.5 PROJECT/SITE CONDITIONS

Glazing work shall not be started until outdoor temperature is above 40 degrees F and rising, unless procedures recommended by glass manufacturer and approved by Contracting Officer are made to warm the glass and rabbet surfaces. Ventilation shall be provided to prevent condensation of moisture on glazing work during installation. Glazing work shall not be performed during damp or raining weather.

1.6 WARRANTY

1.6.1 Insulating Glass

Manufacturer shall warrant the insulating glass to be free of fogging or film formation on the internal glass surfaces caused by failure of the hermetic seal for a period of 20 years from Date of Substantial Completion. Warranty shall be signed by manufacturer. A 10 year warranty shall be provided on all parts.

1.6.2 Monolithic Reflective Glass

Manufacturer shall warrant the monolithic reflective glass to be free of peeling or deteriorating of coating for a period of 10 years after Date of Substantial Completion. Warranty shall be signed by manufacturer.

PART 2 PRODUCTS

2.1 FLOAT GLASS

2.1.1 Annealed Glass

Annealed glass shall be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, conforming to ASTM C 1036.

2.2 ROLLED GLASS

2.2.1 Patterned Glass

Patterned glass shall be Type II flat type. Class 1 - translucent, Finish f1 - patterned one side, Quality q8 - glazing, conforming to ASTM C 1036.

2.3 THICKNESS OF GLASS

Thickness of glass shall be as specified herein unless otherwise noted. Glass in doors shall be 1/4 inch thick. Use double-strength sheet glass or 1/8 inch float glass for openings up to and including 10 square feet, 3/16 inch for glazing openings over 10 square feet but not over 30 square feet, and 1/4 inch for glazing openings over 30 square feet but not over 45 square feet.

2.4 INSULATING GLASS

Insulating glass shall be Class A preassembled units of dual-seal construction consisting of lites of glass separated by an aluminum, steel, or stainless steel, spacer and dehydrated space conforming to ASTM E 773 and ASTM E 774. Spacer shall be roll-formed, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and

eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone. Glass types shall be as follows:

2.4.1 Clear Insulating Glass

Glass for two-pane insulating units shall be Type I annealed glass, Class 1 - clear, Quality q3 - glazing select, conforming to ASTM C 1036.

2.4.2 Low-E Insulating Glass

Interior and exterior glass panes for Low-E insulating units shall be Type I annealed flat glass, Class 1-clear with anti-reflective low-emissivity coating on No. 2 surface (inside surface of exterior pane), Quality q3 - glazing select, conforming to ASTM C 1036.

2.5 HEAT-TREATED GLASS

Heat-treated glass shall conform to the following requirements.

2.5.1 Tempered Glass

Tempered glass shall be kind FT fully tempered transparent flat type, Class 1-clear, Condition A uncoated surface, Quality q3 - glazing select, conforming to ASTM C 1048 and GANA Standards Manual. Tempered glass shall be provided wherever indicated, including glass in doors and for glass shelving. Glass shelving shall be 1/4 inch thick with eased/beveled top and bottom edges. Supports for glass shelving shall be type for drilled holes, steel with white vinyl coating, No. 348 by Knappe & Vogt or approved equal.

2.6 GLAZING ACCESSORIES

2.6.1 Sealant

Sealant shall be elastomeric conforming to ASTM C 920, Type S or M, Grade NS, Class 12.5, Use G, of type chemically compatible with setting blocks, preformed sealing tape and sealants used in manufacturing insulating glass. Color of sealant shall be as selected.

2.6.2 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as indicated on drawings.

2.6.2.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C 509, Type 2, Option 1.

2.6.2.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C 864, Option 1, Shore A durometer between 65 and 75.

2.6.2.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.6.3 Putty and Glazing Compound

Glazing compound shall conform to ASTM C 669 for face-glazing metal sash. Putty shall be linseed oil type conforming to CID A-A-378 for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

2.6.4 Setting and Edge Blocking

Neoprene setting blocks shall be dense extruded type conforming to ASTM D 395, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (+ or - 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

Openings and framing systems scheduled to receive glass shall be examined for compliance with approved shop drawings, GANA Glazing Manual and glass manufacturer's recommendations including size, squareness, offsets at corners, presence and function of weep system, face and edge clearance requirements and effective sealing between joints of glass-framing members. Detrimental materials shall be removed from glazing rabbet and glass surfaces and wiped dry with solvent. Glazing surfaces shall be dry and free of frost.

3.2 INSTALLATION

Glass and glazing work shall be performed in accordance with approved shop drawings, GANA Glazing Manual, glass manufacturer's instructions and warranty requirements. Glass shall be installed with factory labels intact and removed only when instructed. Edges and corners shall not be ground, nipped or cut after leaving factory. Springing, forcing or twisting of units during installation will not be permitted.

3.3 CLEANING

Upon completion of project, outside surfaces of glass shall be washed clean and the inside surfaces of glass shall be washed and polished in accordance with glass manufacturer's recommendations.

3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Glass units which are broken,

chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

-- End of Section --

SECTION 09215A

VENEER PLASTER

11/95

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 472	(1999) Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete
ASTM C 475	(1994) Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C 514	(1996) Nails for the Application of Gypsum Board
ASTM C 587	(1997) Gypsum Veneer Plaster
ASTM C 588/C 588M	(1999) Gypsum Base for Veneer Plasters
ASTM C 754	(1999a) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
ASTM C 844	(1999) Application of Gypsum Base to Receive Gypsum Veneer Plaster
ASTM C 1002	(2000) Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials

The manufacturer's descriptive data for veneer plastering materials.

Manufacturer's installation instructions for veneer plastering materials.

SD-07 Certificates

Fire Resistive Construction

Certificates attesting that the steel framing meets the specified requirements, and that fire-resistive partitions meet the ratings shown.

1.3 GENERAL REQUIREMENTS

The work shall conform to ASTM C 587, ASTM C 754, and ASTM C 844. Gypsum veneer plaster shall be applied as a one component system over a special gypsum base. The veneer plaster, gypsum base, and joint reinforcement shall be products of the same manufacturer. The extent and location of veneer plaster shall be as shown on the approved detail drawings. Metal framing is specified herein. Wood framing is specified in Section 06100A ROUGH CARPENTRY.

1.4 DELIVERY AND STORAGE

Plaster materials shall be delivered and stored in the manufacturer's original unopened containers. Materials shall be stored off the ground within a completely enclosed structure or completely enclosed within a weathertight covering. Gypsum base and gypsum board shall be stored flat so as to prevent warping, shall be protected from excessive exposure to sunlight, and shall have bundling tape intact immediately prior to use.

1.5 SCHEDULING

Installation shall commence only after the area scheduled for veneer plaster work is completely weathertight. The heating, ventilating, and air-conditioning systems should be complete and in operation prior to application of the plaster. If the mechanical systems cannot be activated before veneer plastering is begun, the plastering may proceed in accordance with an approved plan to maintain the environmental conditions specified below. Plaster shall be applied prior to the installation of finish flooring.

1.6 ENVIRONMENTAL REQUIREMENTS

The gypsum base shall not be exposed to excessive sunlight prior to plaster application, as bond failure of the plaster may result. A continuous uniform temperature of not less than 50 degrees F and not more than 80 degrees F shall be maintained for at least one week prior to the application of veneer plaster, while the plastering is being done, and for at least one week after the plaster is set. Air supply and distribution devices shall be shielded to prevent any uneven flow of air across the plastered surfaces. The ventilation rate shall be adjusted to prevent rapid drying.

1.7 FIRE RESISTIVE CONSTRUCTION

Partitions and ceilings indicated to be of fire resistive construction shall be built in compliance with designs as shown on the drawings. Fire-rated assembly shall be in accordance with the Design Numbers indicated.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the requirements specified below. Miscellaneous items not otherwise specified shall be as recommended by the veneer plaster system manufacturer and approved prior to use. Powder driven fasteners may be used only when approved in writing.

2.1.1 Gypsum Base

Gypsum base for veneer plaster shall be in accordance with ASTM C 588/C 588M, regular, except provide Type X for fire rated partitions 48 inches wide, 1/2 inch thick. Edges shall be square, rounded, or tapered as recommended by the veneer plaster manufacturer.

2.1.2 Gypsum Veneer Plaster

Gypsum veneer plaster shall be in accordance with ASTM C 587. Minimum compressive strength of finish coat plaster shall be 800 psi in accordance with ASTM C 472. Plaster finish shall be smooth trowel.

2.1.3 Joint Reinforcement

Joint reinforcement for wood studs or wood furring shall be minimum 2 in wide glass fiber mesh reinforcing strip or perforated cross fibered paper tape as recommended by the veneer plaster manufacturer.

2.1.4 Joint Compound

Joint compound shall be in accordance with ASTM C 475.

2.1.5 Screws

Screws for the installation of gypsum board shall be in accordance with ASTM C 1002, and shall be type appropriate to use.

2.1.6 Nails

Nails shall be in accordance with ASTM C 514, and shall have corrosion-resistant treatment.

2.1.7 Cornerbead and Edge Trim

Cornerbead and edge trim shall be corrosion protective-coated steel or vinyl or clear anodized aluminum as recommended by the veneer plaster manufacturer. Flanges shall be free of any material that would adversely affect bonding of the plaster.

PART 3 EXECUTION

3.1 APPLICATION OF GYPSUM BASE

Gypsum base shall be applied to framing and furring members in accordance with ASTM C 844 and the requirements specified and shall be the type and thickness required by the wall design. Gypsum base and wallboard shall be of maximum practical length, using full length boards for vertical application. Installation shall be with separate boards in moderate contact without forcing in place. Direction of application shall be arranged so leading edge of gypsum base is attached to open edge of stud

flange. Boards shall be installed tight against the framing so as to eliminate any offset in the face plane between adjoining boards. End joints of adjoining boards shall be staggered. Abutting end and edge joints shall be neatly fitted. Boards shall be cut as required to make neat close joints around openings. Gypsum base may be adhered to gypsum wallboard with an adhesive, except where prohibited by fire rating. In multilayer construction, joints shall be offset between layers. Joints on opposite faces of the partition shall be offset. Furr out walls and ceilings as required +/- 1/4 inch in 10 feet, to provide level and flat substrate for attachment of veneer base.

3.1.1 Control Joints

Control joints in ceilings and walls shall be one piece manufactured products designed for use with a veneer plaster system. Control joints shall be installed where indicated.

3.2 JOINT REINFORCEMENT

Interior angles and flat joints in the gypsum base shall be reinforced prior to application of the veneer plaster. Self-adhering mesh shall not be used. Reinforcement shall be a special mesh reinforcing strip embedded in veneer plaster, or gypsum wallboard joint tape embedded in joint compound.

3.2.1 Fiber Mesh Reinforcing

Mesh reinforcing strips shall be thoroughly embedded in veneer plaster, so that embedment material is both under and covering the reinforcement. Areas of reinforcement shall be allowed to preset, and shall be left rough enough for proper bonding of the plaster coat. Reinforcement shall be set, but not dry, before the application of veneer plaster over the entire area.

3.2.2 Perforated Paper Tape Reinforcing

The paper tape shall be pressed into a bedding coat of setting type joint compound, and immediately covered with a skim coat of the same compound. After the bedding and skim coats are set, a fill coat of joint compound shall be applied. The reinforcement shall be set and dry before application of veneer plaster over the entire area.

3.3 APPLICATION OF GYPSUM VENEER PLASTER

Gypsum veneer plaster shall be applied in accordance with ASTM C 587, and the manufacturer's approved installation instructions where such instructions are additional to or more restrictive than the requirements of ASTM C 587. Minimum plaster thickness shall be as recommended by the manufacturer, but shall in no case be less than 1/16 inch for a one-component system.

3.3.1 Mixing

The mixer shall be cleaned between batches to avoid accelerating the setting time. Other plaster materials shall not be added to modify the properties of the veneer plaster. When extreme conditions so demand, small quantities of commercial retarder or accelerator may be added to the mixing water to adjust setting time. The use of retarder or accelerator shall be in strict conformance with the veneer plaster manufacturer's recommendations.

3.3.2 Finish Coat

The finish coat shall be scratched in, then immediately doubled back using material from the same batch. The surface shall be lightly troweled without the addition of water, filling voids and imperfections and eliminating surface irregularities. When the plaster has become firm and prior to set, the surface shall be textured or smoothed; as required, to achieve the indicated finish using water sparingly.

3.4 CLEANUP AND PATCHING

Plaster splashes shall be removed from adjacent surfaces. Defects in the veneer plaster shall be repaired. Plaster surfaces shall be smooth and clean, and in condition to receive the finishing materials that will be applied.

-- End of Section --

SECTION 09225A

STUCCO
11/95

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM C 150	(1999a) Portland Cement
ASTM C 206	(1984; R 1997) Finishing Hydrated Lime
ASTM C 897	(1996) Aggregate for Job-Mixed Portland Cement-Based Plasters
ASTM C 926	(1998a) Application of Portland Cement-Based Plaster
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials

Manufacturers installation instructions for stucco materials.

1.3 DELIVERY AND STORAGE

Packaged materials shall be delivered to the site in the original packages and containers with labels intact and seals unbroken. Cementitious materials shall be kept dry and stored off the ground under cover away from damp surfaces until ready to be used. Aggregate shall be covered to prevent the absorption or loss of moisture.

1.4 ENVIRONMENTAL CONDITIONS

Stucco shall not be applied when the ambient temperature is 40 degrees F or lower, or when a drop in temperature below 40 degrees F is expected within 48 hours after application.

1.5 SCOPE OF WORK

The scope of work includes patching of existing stucco wherever it is marred in any way (cracked, gouged, dented, etc.) by the Contractor's operations, particularly where existing rough hewn wood timbers are to be removed and new timbers are to be provided.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT

Portland cement shall conform to ASTM C 150, white portland cement, Type I.

2.2 COLORED STUCCO FINISH COAT

Colored stucco finish coat shall be a mill mixed product using white portland cement and requiring only the addition of and mixing with water for application. Color shall be similar to color of existing stucco.

2.3 LIME

Lime shall conform to ASTM C 206, Type S.

2.4 SAND

Sand aggregate for job-mixed base coat and job-mixed finish coat stucco shall conform to ASTM C 897.

2.5 ACCESSORIES

Accessories shall be roll formed galvanized steel, or rigid polyvinyl chloride (PVC), except that cornerite and striplath shall be formed from steel sheets with manufacturer's standard galvanized coating. Vinyl members shall be in accordance with ASTM D 1784. Welded wire corner reinforcements shall be zinc coated, galvanized 17 gauge steel wire conforming to ASTM A 185.

2.6 WATER

Water shall be clean, fresh, potable, and free from amounts of oils, acids, alkalis and organic matter that would be injurious to the stucco.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

Preparation of surfaces for application of stucco shall conform to the applicable requirements of ASTM C 926.

3.2 PROPORTIONS AND MIXING

Proportions and mixing for job-mixed base coat and finish coat shall conform to the applicable requirements of ASTM C 926. Mixing of mill-mixed finish coat shall be in accordance with the manufacturer's directions.

3.3 STUCCO APPLICATION

New stucco shall finish flush with existing adjacent stucco. Stucco shall be applied in three coats to a thickness of not less than 1 inch as measured from the back plane of metal reinforcement, exclusive of ribs or dimples or from the face of solid backing or support, with or without metal reinforcement, to the finished stucco surface, including moderate texture variations. Stucco application shall conform to the applicable requirements of ASTM C 926 and the following:

3.3.1 Workmanship

Items or features of the work in connection with or adjoining the stucco shall be in place, plumb, straight, and true prior to beginning the stucco work. Metal and wire lath, where required, shall be in place and positioned to provide a good key at back of lath. Each stucco coat shall be applied continuously in one general direction, without allowing mortar to dry at edges. Where it is impossible to work the full dimension of a wall surface in a continuous operation, jointing shall be made at a break, opening, or other natural division of the surface. Edges to be joined shall be dampened slightly to produce a smooth confluence. Exterior corners of stucco shall be slightly rounded.

3.3.2 Scratch Coat

Scratch coat shall be applied not less than 3/8 inch thick under sufficient pressure to form good keys and to completely embed the reinforcement. Before the scratch coat has set, it shall be lightly scratched in one direction and vertical surfaces shall be scratched in the horizontal direction only. The scratch coat shall be fog cured for a minimum of 72 hours.

3.3.3 Brown Coat

The scratch coat shall be dampened evenly to obtain uniform suction before the brown coat is applied. There shall be no visible water on the surface when the brown coat is applied. The brown coat shall be applied to the scratch coat with sufficient pressure to force the stucco into the scratches and shall be brought to a plumb, true, even plane with rod or straightedge. When set sufficiently, the brown coat shall be uniformly floated with a dry float to promote densification of the coat and to provide a surface receptive to bonding of the finish coat. Brown coat shall be fog cured for a minimum of 72 hours.

3.3.4 Finish Coat

Surfaces of the brown coat shall be dampened not more than 1 hour before the finish coat is to be applied to a uniform wetness with no free-standing water on the surface. The finish coat shall have a texture similar to the existing stucco. The finish coat shall be fog cured for a minimum of 48 hours. Care shall be taken to prevent staining.

3.4 CURING AND PROTECTION

Fog curing shall be accomplished by applying a fine mist of water to the stucco. Care shall be exercised during fog curing to avoid erosion damage to the stucco surfaces. A solid stream of water shall not be used. Frequency of fogging shall be not less than three times daily. When directed the Contractor shall protect the stucco from the direct rays of

the sun during severe drying conditions using canvas, cloth or other approved sheet material.

3.5 PATCHING AND POINTING

Loose, cracked, damaged or defective work shall be replaced or patched as directed. Patching shall match existing work in texture and color and shall be finished flush.

-- End of Section --

SECTION 09250

GYPSUM BOARD

11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11 (1992) Interior Installation of
Cementitious Backer Units

ANSI A118.9 (1992) Cementitious Backer Units

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 36/C 36M (1999) Gypsum Wallboard

ASTM C 475 (1994) Joint Compound and Joint Tape for
Finishing Gypsum Board

ASTM C 557 (1999) Adhesives for Fastening Gypsum
Wallboard to Wood Framing

ASTM C 630/C 630M (2001) Water-Resistant Gypsum Backing Board

ASTM C 840 (2001) Application and Finishing of Gypsum
Board

ASTM C 954 (2000) Steel Drill Screws for the
Application of Gypsum Board or Metal
Plaster Bases to Steel Studs from 0.033 in.
(0.84 mm) to 0.112 in. (2.84 mm) in
Thickness

ASTM C 1002 (2000) Steel Drill Screws for the
Application of Gypsum Panel Products or
Metal Plaster Bases

ASTM C 1047 (1999) Accessories for Gypsum Wallboard and
Gypsum Veneer Base

ASTM C 1178/C 1178M (1999) Glass Mat Water-Resistant Gypsum
Backing Board

ASTM C 1396/C 1396M (2000) Standard Specification for Gypsum
Board

ASTM D 226 (1997) Standard Specification for
Asphalt-Saturated Organic Felt Used in
Roofing and Waterproofing

GYPSUM ASSOCIATION (GA)

GA 214	(1996) Recommended Levels of Gypsum Board Finish
GA 216	(2000) Application and Finishing of Gypsum Board

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Cementitious backer units

Glass Mat Water-Resistant Gypsum Tile Backing Board

Water-Resistant Gypsum Backing Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

SD-07 Certificates

Asbestos Free Materials

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation.

1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Temperature

Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

1.4.2 Exposure to Weather

Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

1.5 QUALIFICATIONS

Manufacturer shall specialize in manufacturing the types of material specified and shall have a minimum of 5 years of documented successful experience. Installer shall specialize in the type of gypsum board work required and shall have a minimum of 3 years of documented successful experience.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified herein. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only.

2.1.1 Gypsum Board

ASTM C 36/C 36M and ASTM C 1396/C 1396M.

2.1.1.1 Regular

48 inches wide, 1/2 inch thick, tapered edges.

2.1.1.2 Type X (Special Fire-Resistant)

48 inches wide, 1/2 inch thick, tapered edges.

2.1.2 Regular Water-Resistant Gypsum Backing Board

ASTM C 630/C 630M

2.1.2.1 Regular

48 inches wide, 1/2 inch thick, tapered edges.

2.1.3 Glass Mat Water-Resistant Gypsum Tile Backing Board

ASTM C 1178/C 1178M

2.1.3.1 Regular

48 inches wide, 1/2 inch thick, square edges.

2.1.4 Cementitious Backer Units

ANSI A118.9.

2.1.5 Joint Treatment Materials

ASTM C 475.

2.1.5.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.5.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.5.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.5.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.5.5 Joint Tape

Cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.6 Fasteners

2.1.6.1 Screws

ASTM C 1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C 954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.7 Adhesives

Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene.

2.1.7.1 Adhesive for Fastening Gypsum Board to Metal Framing

Type recommended by gypsum board manufacturer.

2.1.7.2 Adhesive for Fastening Gypsum Board to Wood Framing

ASTM C 557.

2.1.8 Accessories

ASTM C 1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials that may adversely affect bond of joint treatment.

2.1.9 Asphalt Impregnated Building Felt

The moisture barrier over gypsum sheathing shall be 15-lb asphalt impregnated felt conforming to ASTM D 226 Type I (No. 15).

2.1.10 Water

Clean, fresh, and potable.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

3.1.2 Gypsum Board

Verify that surfaces of gypsum board to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.1.3 Masonry and Concrete Walls

Verify that surfaces of masonry and concrete walls to receive gypsum board applied with adhesive are dry, free of dust, oil, form release agents, protrusions and voids, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C 840 or GA 216 and the requirements specified herein. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length. Cut out gypsum board as required to make neat close joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Application of Single-Ply Gypsum Board to Wood Framing

Apply in accordance with ASTM C 840, System I or GA 216.

3.2.2 Adhesive Application to Interior Masonry or Concrete Walls

Apply in accordance with ASTM C 840, System VI or GA 216.

3.2.3 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C 840, System VIII or GA 216.

3.2.4 Arches and Bending Radii

Apply gypsum board in accordance with ASTM C 840, System IX or GA 216.

3.2.5 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass matt water-resistant gypsum tile backing board or water-resistant gypsum backing board in accordance with ASTM C 840, System X or GA 216.

3.2.6 Floating Interior Angles

Locate the attachment fasteners adjacent to ceiling and wall intersections in accordance with ASTM C 840, System XII or GA 216, for single-ply applications of gypsum board to wood framing.

3.2.7 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C 840, System XIII or GA 216, unless indicated otherwise. Control joints between studs in fire-rated construction shall be filled with firesafing insulation to match the fire-rating of construction.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

3.3.1 Application

In wet areas (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units in accordance with ANSI A108.11. A 15 lb asphalt impregnated, continuous felt paper membrane shall be placed behind cementitious backer units, between backer units and studs or base layer of gypsum board. Membrane shall be placed with a minimum 6 inch overlap of sheets laid shingle style.

3.3.2 Joint Treatment

ANSI A108.11.

3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C 840, GA 214 and GA 216. Plenum areas above ceilings shall be finished to Level 1 in accordance with GA 214. Water resistant gypsum backing board, ASTM C 630/C 630M, to receive ceramic tile shall be finished to Level 2 in accordance with GA 214. Walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting shall be finished to Level 3 in accordance with GA 214. Walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings shall be finished to Level 4 in accordance with GA 214. Unless otherwise specified, all gypsum board walls, partitions and ceilings shall be finished to Level 5 in

accordance with GA 214. Provide joint, fastener depression, and corner treatment. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer.

3.4.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5. In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07900a "Joint Sealing." Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.5.1 Sealing for Glass Mat or Reinforced Gypsum Board Sheathing

Apply silicone sealant in a 3/8 inch bead to all joints and trowel flat. Apply enough of the same sealant to all fasteners penetrating through the glass mat gypsum board surface to completely cover the penetration when troweled flat. Construction and materials shall not be placed behind sheathing until a visual inspection of sealed joints during daylight hours has been completed by Contracting Officer.

3.6 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finish as specified. Remove predecorated gypsum board which cannot be restored to like-new condition. Provide new predecorated gypsum board.

-- End of Section --

SECTION 09310A

CERAMIC TILE

11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1A	(1992) Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar
ANSI A108.1B	(1992) Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar
ANSI A108.5	(1992) Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
ANSI A108.10	(1992) Installation of Grout in Tilework
ANSI A118.1	(1992) Dry-Set Portland Cement Mortar
ANSI A118.2	(1992) Conductive Dry-Set Portland Cement Mortar
ANSI A118.4	(1992) Latex-Portland Cement Mortar
ANSI A118.6	(1992) Ceramic Tile Grouts
ANSI A118.9	(1992) Test Methods and Specifications for Cementitious Backer Units
ANSI A137.1	(1988) Ceramic Tile

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1999a) Concrete Aggregates
ASTM C 144	(1999) Aggregate for Masonry Mortar
ASTM C 150	(1999a) Portland Cement
ASTM C 206	(1984; R 1997) Finishing Hydrated Lime
ASTM C 207	(1991; R 1997) Hydrated Lime for Masonry Purposes
ASTM C 241	(1997) Abrasion Resistance of Stone Subjected to Foot Traffic

ASTM C 373	(1988; R 1994) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
ASTM C 648	(1998) Breaking Strength of Ceramic Tile
ASTM C 847	(1995) Metal Lath
ASTM C 1026	(1987; R 1996) Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling
ASTM C 1027	(1999) Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C 1028	(1996) Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual	(1991) Design Manual IV Dimensional Stone
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TILE COUNCIL OF AMERICA (TCA)

TCA Hdbk	(1997) Handbook for Ceramic Tile Installation
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Tile
Setting-Bed
Mortar, Grout, and Adhesive

Manufacturer's catalog data and preprinted installation and cleaning instructions.

SD-04 Samples

Tile; G
Accessories; G
Marble Thresholds; G

Samples of sufficient size to show color range, pattern, type and joints.

SD-07 Certificates

Tile
Mortar, Grout, and Adhesive

Certificates indicating conformance with specified requirements.
A master grade certificate shall be furnished for tile.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Materials shall be kept dry, protected from weather, and stored under cover in accordance with manufacturer's instructions.

1.4 ENVIRONMENTAL REQUIREMENTS

Ceramic tile work shall not be performed unless the substrate and ambient temperature is at least 50 degrees F and rising. Temperature shall be maintained above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used they shall be vented to the outside to avoid carbon dioxide damage to new tilework.

1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period shall be provided.

PART 2 PRODUCTS

2.1 TILE

Tile shall be standard grade conforming to ANSI A137.1. Containers shall be grade sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate. Tile shall be impact resistant with a minimum breaking strength for wall tile of 90 lbs and 250 lbs for floor tile in accordance with ASTM C 648. Tile for cold climate projects shall be rated frost resistant by the manufacturer as determined by ASTM C 1026. Water absorption shall be 0.50 maximum percent in accordance with ASTM C 373.

Floor tile shall have a minimum coefficient of friction of 0.60 wet and dry in accordance with ASTM C 1028. Floor tile shall be Class III-Medium Heavy Traffic, durability classification as rated by the manufacturer when tested in accordance with ASTM C 1027 for abrasion resistance as related to foot traffic.

2.1.1 Glazed Wall Tile

Glazed wall tile and trim shall be cushion edged with bright glaze. Tile shall be 6 x 6 inches. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

2.1.2 Accessories

Accessories shall be the built-in type of the same materials and finish as the wall tile. Accessories shall be provided as noted on drawings.

2.2 SETTING-BED

The setting-bed shall be composed of the following:

2.2.1 Aggregate for Concrete Fill

Aggregate shall conform to ASTM C 33. Maximum size of coarse aggregate

shall not be greater than one-half the thickness of concrete fill.

2.2.2 Portland Cement

Cement shall conform to ASTM C 150, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Sand shall conform to ASTM C 144.

2.2.4 Hydrated Lime

Hydrated lime shall conform to ASTM C 206, Type S or ASTM C 207, Type S.

2.2.5 Metal Lath

Metal lath shall be flat expanded type conforming to ASTM C 847, and weighing not less than 2.5 pounds per square yard.

2.3 WATER

Water shall be potable.

2.4 MORTAR, GROUT, AND ADHESIVE

Mortar, grout, and adhesive shall conform to the following:

2.4.1 Dry-Set Portland Cement Mortar

ANSI A118.1.

2.4.2 Conductive Dry-Set Mortar

ANSI A118.2.

2.4.3 Latex-Portland Cement Mortar

ANSI A118.4.

2.4.4 Ceramic Tile Grout

ANSI A118.6; sand portland cement grout.

2.4.5 Cementitious Backer Board

Cementitious backer units, for use as title substrate over wood sub-floors, shall be in accordance with ANSI A118.9. Cementitious backer units shall be 1/2inch thick.

2.5 MARBLE THRESHOLDS

Marble thresholds shall be of size required by drawings or conditions. Marble shall be Group A as classified by MIA Design Manual. Marble shall have a fine sand-rubbed finish and shall be white. Marble abrasion shall be not less than 12.0 when tested in accordance with ASTM C 241.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Surface to receive tile shall be inspected and shall conform to the requirements of ANSI A108.1A or ANSI A108.1B for surface conditions for the type setting bed specified and for workmanship. Variations of surface to be tiled shall fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex portland cement mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Tile work shall not be started until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Floor tile installation shall not be started in spaces requiring wall tile until after wall tile has been installed. Tile in colors and patterns indicated shall be applied in the area shown on the drawings. Tile shall be installed with the respective surfaces in true even planes to the elevations and grades shown. Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Tile bases and coves shall be solidly backed with mortar.

3.3 INSTALLATION OF WALL TILE

Wall tile shall be installed in accordance with the TCA Hdbk, method W244-2002.

3.3.1 Workable or Cured Mortar Bed

Tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor. A 4 mil polyethylene membrane, metal lath, and scratch coat shall also be installed. Workable mortar bed, materials, and installation of tile shall conform to ANSI A108.1A. Cured mortar bed and materials shall conform to ANSI A108.1B.

3.3.2 Dry-Set Mortar

Dry-set shall be used to install tile in accordance with ANSI A108.5.

3.4 INSTALLATION OF FLOOR TILE

Floor tile shall be installed in accordance with TCA Hdbk, method F146-2002. Shower receptors shall be installed in accordance with TCA Hdbk, method B415.

3.4.1 Workable or Cured Mortar Bed

Floor tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor. Workable mortar bed materials and installation shall conform to ANSI A108.1A. Cured mortar bed and materials shall conform to ANSI A108.1B. Joints between quarry tile shall be between 1/4 inch and 3/8 inch in width and shall be uniform in width.

3.4.2 Dry-Set and Latex-Portland Cement

Dry-set mortar shall be used to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.5. Latex portland cement shall be used when installing porcelain ceramic tile.

3.4.3 Ceramic Tile Grout

Ceramic Tile grout shall be prepared and installed in accordance with ANSI A108.10.

3.4.4 Waterproofing

Shower pans are specified in Section 15400 PLUMBING, GENERAL PURPOSE. Waterproofing under concrete fill shall conform to the requirements of Section 07132 BITUMINOUS WATERPROOFING.

3.5 INSTALLATION OF MARBLE THRESHOLDS

Thresholds shall be installed where indicated in a manner similar to that of the ceramic tile floor. Thresholds shall be the full width of the opening. Head joints at ends shall not exceed 1/4 inch in width and shall be grouted full as specified for ceramic tile.

3.6 EXPANSION JOINTS

Joints shall be formed as indicated and sealed as specified in Section 07900 JOINT SEALING.

3.6.1 Walls

Expansion joints shall be provided at control joints in backing material. Wherever backing material changes, an expansion joint shall be installed to separate the different materials.

3.6.2 Floors

Expansion joints shall be provided over construction joints, control joints, and expansion joints in concrete slabs.

3.7 CLEANING AND PROTECTING

Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Acid shall not be used for cleaning glazed tile. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer. After the grout has set, tile wall surfaces shall be given a protective coat of a noncorrosive soap or other approved method of protection. Tiled floor areas shall be covered with building paper before foot traffic is permitted over the finished tile floors. Board walkways shall be laid on tiled floors that are to be continuously used as passageways by workmen. Damaged or defective tiles shall be replaced.

-- End of Section --

SECTION 09562

REPAIR AND REFURBISHMENT OF WOOD STRIP FLOORING
11/99

PART 1 GENERAL

1.1 DESCRIPTION

Work included under this section includes the repair of existing wood strip flooring and preparation of strip floor for refinishing under Section 09900 PAINTING, GENERAL. Existing wood floors have been repeatedly sanded and refinished over the past years leaving only a thin layer of wood coverage over tongue and groove joints typically throughout several family housing units. Work specified herein addresses the techniques to be used in stripping the existing wood floor finish with minimal loss of wood joint coverage. Additionally, repair to existing floors is specified herein addressing the patching of floors damaged by other work under this contract as well as replacement of any existing cracked, split, defaced, or otherwise damaged wood floor members.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

FEDERAL SPECIFICATIONS

FS TT-F-336E

(Rev E) Filler, Wood, Paste (1978)

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Refurbishment; G.

The Contractor shall submit a general work plan describing the techniques of wood floor repair and refurbishment. The plan shall demonstrate the intended course of coordination with work of other trades. The Contractor shall submit a specific work plan for each family housing unit which identifies the extent of wood strip flooring and location of necessary repairs as required herein.

SD-03 Product Data

Operating Instructions

Submit manufacturer's data for equipment to be used in stripping floors including sanders and all operating instructions.

SD-07 Certificates

Restorer Qualifications

Submit wood floor restorer's qualifications and credentials to perform the work herein specified. Demonstrate at least five years of experience in wood floor restoration and successful completion of at least three wood floor restorations in historic homes built not before 1930.

1.4 INSPECTION

The Contractor and wood floor restorer shall conduct a thorough inspection of each family housing unit immediately prior to commencement of wood floor restoration in order to survey the condition of wood strip flooring throughout the quarters. The extent of wood coverage over existing tongue and groove joints shall be examined to familiarize quality control personnel with the limitations on sanding depth. Locations of damaged wood floor members shall be identified for patching or replacement. Inquiries, interpretations, or questions of degree regarding floor repair and sanding should be addressed to the Contracting Officer prior to commencement of work.

1.5 DELIVERY AND STORAGE

Materials to be used in patching of wood strip flooring shall be delivered to the site and stored indoors under protective cover in well ventilated areas and protected from extreme changes in temperature and humidity. Temperature and humidity in the storage area shall closely approximate the temperature and humidity of the rooms in which the flooring is to be installed.

1.6 ENVIRONMENTAL CONDITIONS

Rooms where wood flooring is to be patched or replaced shall have adequate arrangements for ventilation and temperature controls. The temperature shall be maintained at 65 to 80 degrees F starting not less than three days prior to beginning of the installation of flooring and continuing throughout the remainder of the contract period.

1.7 SCHEDULING

Strip flooring work shall be scheduled after any work which would raise the moisture content of the flooring or damage the finished surface of the flooring.

PART 2 PRODUCTS

2.1 STRIP FLOORING

Strip flooring used for repair and replacement shall be oak, NHLA RMIHC to match existing wood flooring and shall be provided new. (The Contractor shall verify species of existing wood floor to assure new floor is same species at existing floor.) Wood strips shall be sized in width and depth to match existing wood flooring. Alternate species may be submitted for use if grain and finish color can be demonstrated to match existing flooring sufficiently.

2.2 NAILS

Nails shall be in accordance with strip flooring industry norms. Nails shall be self-clinching, L-shaped cleats designed for use in mallet-driven

nailing device. As an alternative, case hardened cot nails, designed for wood floors may be used. Nailing device shall be hand-held and permit driving of nails at a 45 degree angle above the strip tongue. Surface nail devices will be permitted for installation of wood strip pieces where tongue cannot be exposed. Surface nailing shall be performed with self-clinching finish nails. Set surface nails and fill holes with wood putty prior to refinishing. Wood putty shall comply with FS TT-F-336E. Use colored putty to match finished flooring.

2.3 SANDING DEVICES

Heavy duty drum-type sanders with built-in vacuum for dust collection and automatic drum pressure control shall be used for area sanding. Reciprocating hand-held sanders with attached dust collection bags shall be used for edge sanding. Circular-motion sanders may be used only for final buffing with a pad or screen of No. 2 steel wool.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

Surfaces to be repaired and restored shall be clean, dry and approved prior to start of work. Existing exposed nail heads shall be set and filled with wood putty matching the color of existing wood strip flooring. Prior to commencement of sanding, seal all wall, floor and ceiling openings, duct penetrations, diffusers, air returns, light fixtures with 6-mil poly plastic sheeting and tape to prevent the spread of wood dust into these items.

3.2 REPAIR OF WOOD STRIP FLOORING

Repair wood strip flooring prior to preparing for refinishing. Carefully remove damaged pieces of wood flooring with as little damage and removal of adjacent pieces as possible. Strip in new replacement pieces after pre-sanding replacement pieces to approximate depth required to match existing strip flooring thickness. Each strip shall be laid with close joints, snugly driven up or set down providing for absorption of a small amount of expansion. Alternate end joints in random pattern matching existing strip layout.

3.3 PREPARATION FOR REFINISHING

Except where existing wood coverage is 1/16 inch or less over tongue and groove joints, sand all wood strip flooring using a drum-type sander for two passes; the first with 80 grit sandpaper, the second using 100 grit or finer sandpaper. Both passes shall be in the same direction, parallel to the direction of the grain of strip flooring. Edge sanding shall be performed in a similar fashion using a hand-held reciprocating sander. A third, final pass shall be made over all areas using a circular-motion sander equipped with a buffing pad or screen of No. 2 steel wool. Areas not accessible to hand-held reciprocating sanders shall be sanded by hand. Sand to a smooth, even uniform finish without burns. Sand replacement pieces to identical thickness as adjacent existing wood strips. Remove a minimal thickness of existing wood surface up to 1/64 inch and in no case exceeding 1/32 inch. Where existing wood strip flooring has 1/16 inch or less coverage over tongue and groove joints, rub floors by hand with a cloth and commercially-available varnish remover such as Varsol, allow to dry, and make a single pass with a circular sander equipped with a buffing screen. Remove as much existing floor finish as possible while retaining

uniform floor color and texture. The final buffing shall be performed at a time and manner permitting prompt clean up and application of first seal coat. The flooring shall be left clean and ready to receive the finishing materials. Vacuum all floors, walls, sills and other surfaces where dust from sanding may have settled prior to application of finishing materials. Handle machinery, vacuums, and dust collection devices carefully while emptying to avoid the spread of wood dust. Collect and store dust in sealed bags and thoroughly vacuum all areas where dust is handled and stored. Personnel operating sanding equipment shall wear protective eye cover and breathing mask over mouth and nose while operating equipment and performing cleanup operations to prevent ingestion of wood dust. Dispose of wood dust in sealed containers off Government property.

3.4 SEALING AND VARNISHING

Apply sealer and varnish as specified in Section 09900 PAINTING, GENERAL. Allow coats to dry thoroughly before application of next coat. Lightly buff floors with No. 2 steel wool after the first coat of varnish has thoroughly dried. Maintain environmental conditions as specified herein throughout the sealing and varnishing process. Maintain color and texture continuity throughout all areas in each family housing unit. Refinish any areas not consistent with color and texture as required for continuity among adjacent surfaces.

3.5 PROTECTION AND FINAL CLEANING

Protect all wood strip flooring from the time of commencing wood floor restoration until final acceptance by the Government. Apply kraft paper as necessary over walking paths and surfaces. Remove all temporary protective surfaces measures including plastic sheeting kraft paper and tape. Clean all surfaces thoroughly with a soft cloth or dry mop prior to final inspection.

-- End of Section --

SECTION 09640A

WOOD STRIP FLOORING

11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 226 (1997a) Asphalt-Saturated Organic Felt Used
in Roofing and Waterproofing

MAPLE FLOORING MANUFACTURERS ASSOCIATION (MFMA)

MFMA-01 (1997)(DATE N/A) Spec Data Sheet; Wood
Flooring, Maple

NATIONAL OAK FLOORING MANUFACTURERS ASSOCIATION (NOFMA)

NOFMA Grading Rules (1997) Flooring Grading Rules, Oak, Beech,
Birch, Hard Maple, Pecan

1.2 SYSTEM DESCRIPTION

This specification is written to allow the Contractor to build wood strip floorings for gymnasiums, handball and squash courts, and other special purpose applications but does not preclude the installation of competitive, manufacturer standard, integrated systems.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation

Manufacturer's descriptive data and installation instructions.

SD-04 Samples

Strip Flooring; G

Two samples of each type of strip flooring.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in original unopened packages, bundles or containers and with all labels intact. Flooring shall be stored in fully covered, well ventilated areas and protected from extreme changes in temperature and humidity. Flooring shall be maintained at an average moisture content of 6 to 9 percent. Temperature and humidity in the storage area shall closely approximate the temperature and humidity of the rooms in which the flooring is to be installed.

1.5 ENVIRONMENTAL CONDITIONS

Rooms where wood flooring is to be installed shall have permanent heating and air conditioning installed and working or adequate arrangements for ventilation and temperature controls. The temperature shall be maintained at 55 to 80 degrees F and the humidity shall be maintained as recommended by the manufacturer starting not less than 3 days prior to beginning the installation of flooring and continuing throughout the remainder of the contract period.

1.6 SCHEDULING

Strip flooring work shall be scheduled after any other work which would raise the moisture content of the flooring or damage the finished surface of the flooring.

PART 2 PRODUCTS

2.1 STRIP FLOORING

Strip flooring shall be 3/4 inch thick by 2-1/4 inches face width, kiln dried, continuous tongue and groove and of standard lengths. Beech and birch shall be second grade in accordance with NOFMA Grading Rules. Hard maple shall be second and better in accordance with MFMA-01. Red and white oak shall be select grade in accordance with NOFMA Grading Rules. Strip flooring shall be marked with the trademark of the grading agency.

2.2 NAILS

Nails shall be in accordance with strip flooring manufacturer's recommendations.

2.3 FELT UNDERLAYMENT

Felt underlayment shall conform to ASTM D 226, Type 1, No. 15. asphalt saturated felt.

PART 3 EXECUTION

3.1 INSTALLATION

Flooring shall be installed in accordance with the approved installation instructions of the manufacturer. Unless otherwise approved, flooring shall be laid parallel to the length of the area to be floored. Strips shall be laid with close joints, snugly driven up but providing for absorption of a small amount of expansion. End joints shall be so alternated that there will be at least two boards between end joints in the same plane and at least 6 inches between end joints in adjacent boards. Space for expansion shall be left along perimeter walls and around fixed projections through the floor surface. Unless otherwise shown or permitted

by the approved installation instructions, expansion space shall be 1/16 inch per foot of distance between opposite walls, with one half the space provided at each wall and with a minimum space of 1 inch at each wall.

3.2 SANDING

Flooring shall be sanded to a smooth, even, uniform finish without burns. A minimum of three sanding cuts, each with a finer sandpaper, shall be made. A heavy drum-type sander shall be used for floors, except a disc-type sander will be permitted for the final cut on strip flooring. Either the first pass or the second pass of the drum-type sander shall be at an angle of 45 degrees to the grain; other passes of the drum-type sander shall be in the direction of the grain of strip flooring. Edges not reached by the sander shall be finished with an edger or by hand methods. The final sanding shall be performed at a time and in a manner that will permit application of the first seal coat as specified in Section 09900 PAINTING, GENERAL to be completed within 8 hours after completion of sanding. The flooring shall be left clean and ready to receive the finishing materials.

3.3 PROTECTION

From the time of installation until final acceptance, flooring shall be protected from damage.

-- End of Section --

SECTION 09650A
RESILIENT FLOORING
07/96

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2240	(1997e1) Rubber Property - Durometer Hardness
ASTM D 4078	(1992; R 1996) Water Emulsion Floor Polish
ASTM F 1303	(1999) Sheet Vinyl Floor Covering with Backing

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Resilient Flooring and Accessories

Manufacturer's descriptive data and installation instructions including cleaning and maintenance instructions.

SD-04 Samples

Flooring; G

Three samples of each indicated color and type of flooring and base. Sample size shall be minimum 2-1/2 x 4 inches.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the building site in original unopened containers bearing the manufacturer's name, project identification, and handling instructions. Materials shall be stored in a clean dry area with temperature maintained above 70 degrees F for 2 days prior to installation, and shall be stacked according to manufacturer's recommendations. Materials shall be protected from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances.

1.4 ENVIRONMENTAL REQUIREMENTS

Areas to receive resilient flooring shall be maintained at a temperature above 70 degrees F and below 100 degrees F for 2 days before application, during application and 2 days after application. A minimum temperature of 55 degrees F shall be maintained thereafter.

1.5 SCHEDULING

Resilient flooring application shall be scheduled after the completion of other work which would damage the finished surface of the flooring.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

1.7 EXTRA MATERIALS

Extra flooring material of each color and pattern shall be furnished at the rate of 5 square feet for each 1000 square feet of sheet flooring installed.

PART 2 PRODUCTS

2.1 SHEET VINYL FLOORING TYPE

Sheet vinyl flooring shall be composed of a homogeneous, vinyl composition.

Flooring shall be not less than 72 inches wide. Sheet vinyl flooring with backing shall conform to ASTM F 1303, Type II, Grade 1 (minimum wear layer thickness 0.050 inches and minimum overall thickness 0.080 inches.

2.2 STAIR TREADS

Treads, risers, and stringers shall conform to composition rubber compounded from a mixture of synthetic and reclaimed rubber. Overall thickness at treads shall be not less than 1/8 inch. Durometer hardness shall be 90, plus or minus 5, when tested in accordance with ASTM D 2240, vinyl compounded from virgin polymer or copolymer of vinyl chloride resin, plasticized with phosphate or phthalate esters. Overall thickness shall be not less than 3/32 inch. Design shall be either a one piece nosing/tread. Surface of treads shall be raised ribbed pattern.

2.3 ADHESIVE

Adhesive for flooring and wall base shall be as recommended by the flooring manufacturer.

2.4 POLISH

Polish shall conform to ASTM D 4078.

2.5 SEALANTS

Sealants shall be in accordance with Section 07900A JOINT SEALING.

2.6 MANUFACTURER'S COLOR AND TEXTURE

Color and texture shall be as indicated.

PART 3 EXECUTION

3.1 EXAMINATION/VERIFICATION OF CONDITIONS

The Contractor shall examine and verify that site conditions are in agreement with the design package and shall report all conditions that will prevent a proper installation. The Contractor shall not take any corrective action without written permission from the Government.

3.2 SURFACE PREPARATION

Flooring shall be in a smooth, true, level plane. Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected, and all damaged portions of concrete slabs shall have been repaired as recommended by the flooring manufacturer. Paint, varnish, oils, release agents, sealers, waxers, and adhesives shall be removed, as recommended by the flooring manufacturer.

3.3 INSTALLATION OF SHEET VINYL FLOORING

Sheet vinyl flooring shall be installed with adhesive in accordance with the manufacturer's written installation instructions. Flooring shall be fitted to the room by hand cutting, straight scribing, or pattern scribing as necessary to suit job conditions. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Seams shall be cut by overlapping or underscribing as recommended by the manufacturer. Seams and edges of sheet vinyl flooring shall be bonded or welded as recommended by the manufacturer. Seams at doorways shall be located parallel to and centered directly under doors. Seams shall not be made perpendicular to doors or at pivot points.

3.4 INSTALLATION OF FEATURE STRIPS

Edge strips shall be secured with adhesive as recommended by the manufacturer. Edge strips shall be provided at locations where flooring termination is higher than the adjacent finished flooring, except at doorways where thresholds are provided.

3.5 INSTALLATION OF TREADS

Stair treads shall be installed with adhesive in accordance with the manufacturer's written installation instructions. Treads shall cover the full width of the stairs. Stairs wider than manufacturer's standard lengths shall have equal length pieces butted together to cover the treads.

3.6 CLEANING

Immediately upon completion of installation of tile in a room or an area, flooring and adjacent surfaces shall be cleaned to remove all surplus adhesive. After installation, flooring shall be washed with a cleaning solution, rinsed thoroughly with clear cold water, and, except for raised pattern rubber flooring, rubber tile and sheet rubber flooring, rubber stair treads, and static control vinyl tile, given two coats of polish in accordance with manufacturers written instructions. After each polish coat, floors shall be buffed to an even luster with an electric polishing machine.

3.7 PROTECTION

From the time of laying until acceptance, flooring shall be protected from damage as recommended by the flooring manufacturer. Flooring which becomes damaged, loose, broken, or curled shall be removed and replaced.

-- End of Section --

SECTION 09680A

CARPET
05/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 16	(1998) Test Method: Colorfastness to Light
AATCC 134	(1996) Test Method: Electrostatic Propensity of Carpets
AATCC 165	(1999) Test Method: Colorfastness to Crocking: Carpets - AATCC Crockmeter Method

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 418	(1993; R 1997) Pile Yarn Floor Covering Construction
ASTM D 1423	(1999) Twist in Yarns by the Direct-Counting Method
ASTM D 5252	(1998a) Practice for the Operation of the Hexapod Tumble Drum Tester
ASTM D 5417	(1999) Practice for Operation of the Vettermann Drum Tester
ASTM E 648	(2000) Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

CARPET AND RUG INSTITUTE (CRI)

CRI 104	(1996) Commercial Carpet Installation Standard
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1630	Standard for the Surface Flammability of Carpet and Rugs (FF 1-70)
40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Carpet

Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory.

Surface Preparation Installation

Three copies of the manufacturer's printed installation instructions for the carpet, including preparation of substrate, seaming techniques, and recommended adhesives and tapes.

SD-04 Samples

Carpet; G Molding

a. Carpet: Two "Production Quality" samples 18 x 18 inches of each carpet proposed for use, showing quality, pattern, and color specified.

b. Vinyl or Aluminum Moldings: Two pieces of each type at least 12 inches long.

c. Special Treatment Materials: Two samples showing system and installation method.

SD-07 Certificates

Carpet

Certificates of compliance from a laboratory accredited by the National Laboratory Accreditation Program of the National Institute of Standards and Technology attesting that each type of carpet and carpet with cushion material conforms to the standards specified.

SD-10 Operation and Maintenance Data

Carpet Cleaning and Protection

Three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

1.3 REGULATORY REQUIREMENTS

Carpet and adhesives shall bear the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) label or demonstrate compliance with testing criteria and

frequencies through independent laboratory test results. Carpet type bearing the label will indicate that the carpet has been tested and meets the criteria of the CRI IAQ Carpet Testing Program, and minimizes the impact on indoor air quality. Contractor shall procure carpet in accordance with 40 CFR 247. Carpet shall conform to EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS. Where possible, product shall be purchased locally to reduce emissions of fossil fuels from transporting.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Materials shall be stored in a clean, dry, well ventilated area, protected from damage and soiling, and shall be maintained at a temperature above 60 degrees F for 2 days prior to installation.

1.5 ENVIRONMENTAL REQUIREMENTS

Areas in which carpeting is to be installed shall be maintained at a temperature above 60 degrees F for 2 days before installation, during installation, and for 2 days after installation. A minimum temperature of 55 degrees F shall be maintained thereafter for the duration of the contract. Traffic or movement of furniture or equipment in carpeted area shall not be permitted for 24 hours after installation. Other work which would damage the carpet shall be completed prior to installation of carpet.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties including minimum ten (10) year wear warranty, two (2) year material and workmanship and ten (10) year tuft bind and delamination.

1.7 EXTRA MATERIAL

Extra material from same dye lot consisting of full width continuous broadloom shall be provided for future maintenance. A minimum of 5 percent of total square yards of each carpet type, pattern, and color shall be provided.

PART 2 PRODUCTS

2.1 CARPET TYPE

Carpet shall be first quality; free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Carpet materials and treatments shall be reasonably nonallergenic and free of other recognized health hazards. All grade carpets shall have a static control construction which gives adequate durability and performance.

2.1.1 Physical Characteristics

Carpet shall comply with the following:

- a. Carpet Construction: Tufted.
- b Type: Broadloom 12 feet minimum usable carpet width with exception

of corridors and stairs.

- c. Pile Type: Cut pile.
- d. Pile Fiber: Commercial 100% branded (federally registered trademark) nylon staple.
- e. Pile or Wire Height: Minimum .531 inch in accordance with ASTM D 418.
- f. Yarn Ply: Minimum 2 in accordance with ASTM D 1423.
- g. Gauge or Pitch: Minimum 5/32 inch in accordance with ASTM D 418.
- h. Stitches or Rows/Wires: Minimum 8 per square inch.
- i. Finished Pile Yarn Weight: Minimum 37.1 ounces per square yard. This does not include weight of backings. Weight shall be determined in accordance with ASTM D 418.
- j. Pile Density: Minimum 2671 oz/cubic yd.
- k. Dye Method: Continuous dye.
- l. Backing Materials: Primary backing materials shall be polypropylene. Secondary backing to suit project requirements shall be those customarily used and accepted by the trade for each type of carpet, except when a special unitary back designed for gluedown is provided.

2.1.2 Performance Requirements

- a. ARR (Appearance Retention Rating): Carpet shall be tested and have the minimum 2.5-3.0 (Moderate) ARR when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified.
- b. Static Control: Static control shall be provided to permanently control static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC 134.
- c. Flammability and Critical Radiant Flux Requirements: Carpet shall comply with 16 CFR 1630. Carpet in corridors and exits shall have a minimum average critical radiant flux of 0.22 watts per square centimeter when tested in accordance with ASTM E 648.
- d. Tuft Bind: Tuft bind force required to pull a tuft or loop free from carpet backing shall be a minimum 3 pound average force for cut pile.
- e. Colorfastness to Crocking: Dry and wet crocking shall comply with AATCC 165 and shall have a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.
- f. Colorfastness to Light: Colorfastness to light shall comply with AATCC 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and shall have a minimum 4 grey scale rating

after 40 hours.

g. Delamination Strength: Delamination strength for tufted carpet with a secondary back shall be minimum of 2.5 lbs./inch.

2.2 SEPARATE CARPET CUSHION

Rubber coated Jute and Animal Fir or Fiber FS-DDD-C-001023, Type 2.39 oz. per sq. yd., gauge 7/16 minimum, density minimum 5.0 nominal LS/CU/FT.

2.3 MOLDING

Aluminum molding shall be a hammered surface, pinless clamp-down type, designed for the type of carpet being installed. Finish shall be natural color anodized. Floor flange shall be a minimum 1-1/2 inches wide and face shall be a minimum 5/8 inch wide. Vinyl molding shall be heavy-duty and designed for the type of carpet being installed. Floor flange shall be a minimum 2 inches wide.

2.4 TAPE

Tape for seams shall be as recommended by the carpet manufacturer for the type of seam used in installation.

2.5 COLOR, TEXTURE, AND PATTERN

Color, texture, and pattern shall be in accordance with Section 09915 COLOR SCHEDULE.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Carpet shall not be installed on surfaces that are unsuitable and will prevent a proper installation. Holes, cracks, depressions, or rough areas shall be repaired using material recommended by the carpet or adhesive manufacturer. Floor shall be free of any foreign materials and swept broom clean. Before beginning work, subfloor shall be tested with glue and carpet to determine "open time" and bond.

3.2 MOISTURE AND ALKALINITY TESTS

Concrete slab shall be tested for moisture content and excessive alkalinity in accordance with CRI 104.

3.3 INSTALLATION

All work shall be performed by installers who are CFI certified (International Certified Floorcovering Installer Association), or manufacturer's approved installers. Installation shall be in accordance with the manufacturer's instructions and CRI 104. Edges of carpet meeting hard surface flooring shall be protected with molding; installation shall be in accordance with the molding manufacturer's instructions.

3.3.1 Broadloom Installation

Broadloom carpet shall be installed stretch-in with tackless strips and shall be smooth, uniform, and secure, with a minimum of seams. Seams shall be uniform, unnoticeable, and treated with a seam adhesive. Side seams

shall be run toward the light where practical and where such layout does not increase the number of seams. Breadths shall be installed parallel, with carpet pile in the same direction. Patterns shall be accurately matched. Cutouts, as at door jambs, columns and ducts shall be neatly cut and fitted securely. Seams at doorways shall be located parallel to and centered directly under doors. Seams shall not be made perpendicular to doors or at pivot points. Seams at changes in directions of corridors shall follow the wall line parallel to the carpet direction. Corridors with widths less than 6 feet shall have the carpet laid lengthwise down the corridors. Stairs shall be installed in a waterfall installation with bound edges.

3.4 CLEANING AND PROTECTION

3.4.1 Cleaning

After installation of the carpet, debris, scraps, and other foreign matter shall be removed. Soiled spots and adhesive shall be removed from the face of the carpet with appropriate spot remover. Protruding face yarn shall be cut off and removed. Carpet shall be vacuumed clean.

3.4.2 Protection

The installed carpet shall be protected from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Edges of kraft paper protection shall be lapped and secured to provide a continuous cover. Traffic shall be restricted for at least 45 hours. Protective covering shall be removed when directed by the Contracting Officer.

3.5 REMNANTS

Remnants remaining from the installation, consisting of scrap pieces more than 2 feet in dimension with more than 6 square feet total, shall be provided. Non-retained scraps shall be removed from site and recycled appropriately.

-- End of Section --

SECTION 09900

PAINTS AND COATINGS

02/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH Limit Values	(1991-1992) Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
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ACGIH TLV-DOC	Documentation of Threshold Limit Values and Biological Exposure Indices
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 235	Standard Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
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ASTM D 523	(1999) Standard Test Method for Specular Gloss
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ASTM C 920	(1998) Elastomeric Joint Sealants
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ASTM D 2092	(1995) Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting
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ASTM D 4214	(1998) Evaluating the Degree of Chalking of Exterior Paint Films
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ASTM D 4263	(1983; R 1999) Indicating Moisture in Concrete by the Plastic Sheet Method
-------------	--

ASTM D 4444	(1998) Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters
-------------	---

ASTM F 1869	(1998) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
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FEDERAL STANDARDS (FED-STD)

FED-STD-313	(Rev. C) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
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MASTER PAINTERS INSTITUTE (MPI)

MPI 4	(2001) Interior/Exterior Latex Block Filler
MPI 7	(2001) Exterior Oil Wood Primer
MPI 10	(2001) Exterior Latex, Flat
MPI 11	(2001) Exterior Latex, Semi-Gloss
MPI 23	(2001) Surface Tolerant Metal Primer
MPI 26	(2001) Cementitious Galvanized Metal Primer
MPI 31	(2001) Polyurethane, Moisture Cured, Clear Gloss
MPI 39	(2001) Interior Latex-based Wood Primer
MPI 44	Interior Latex, Gloss Level 2
MPI 45	(2001) Interior Primer Sealer
MPI 47	(2001) Interior Alkyd, Semi-Gloss
MPI 50	(2001) Interior Latex Primer Sealer
MPI 52	(2001) Interior Latex, Gloss Level 3
MPI 57	(2001) Interior Oil Modified Clear Urethane, Satin
MPI 59	(2001) Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss
MPI 77	(2001) Epoxy Cold Cured, Gloss
MPI 79	(2001) Marine Alkyd Metal Primer
MPI 94	(2001) Exterior Alkyd, Semi-Gloss
MPI 95	(2001) Fast Drying Metal Primer
MPI 107	(2001) Rust Inhibitive Primer (Water-Based)
MPI 139	(2001) High Performance Latex, White and Tints - MPI Gloss Level 3

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS-EPP-SP01-01	(2001) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints
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STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC PA 1	(2000) Shop, Field, and Maintenance Painting
SSPC VIS 1	(1989) Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs)

SSPC VIS 3	(1993) Visual Standard for Power- and Hand-Tool Cleaned Steel (Standard Reference Photographs)
SSPC VIS 4	(2001) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting
SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 2	(1995) Hand Tool Cleaning
SSPC SP 3	(1995) Power Tool Cleaning
SSPC SP 6	(1994) Commercial Blast Cleaning
SSPC SP 7	(1994) Brush-Off Blast Cleaning
SSPC SP 10	(1994) Near-White Blast Cleaning
SSPC SP 12	(1995) Surface Preparation and Cleaning of Steel and Other Hard Materials by High-and Ultra high-Pressure Water Jetting Prior to Recoating

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

In keeping with the intent of Executive Order 13101, "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition", products certified by SCS as meeting SCS-EPP-SP01-01 shall be given preferential consideration over registered products. Products that are registered shall be given preferential consideration over products not carrying any EPP designation.

SD-03 Product Data

Coating; G

SD-04 Samples

Color; G

Submit manufacturer's samples of paint colors. Cross reference color

samples to color scheme as indicated.

SD-07 Certificates

Applicator's qualifications

SD-08 Manufacturer's Instructions

Application instructions

Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

SD-10 Operation and Maintenance Data

Coatings:

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

1.3 APPLICATOR'S QUALIFICATIONS

1.3.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

- a. Name of individual and proposed position for this work.
- b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

1.4 QUALITY ASSURANCE

1.4.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph "Sampling Procedures." Test each chosen product as specified in the paragraph "Testing Procedure." Products which do not conform, shall be removed from the job site and replaced with new products that conform to the referenced specification. Testing of replacement products that failed initial testing shall be at no cost to the Government.

1.4.1.1 Sampling Procedure

The Contracting Officer will select paint at random from the products that have been delivered to the job site for sample testing. The Contractor shall provide one quart samples of the selected paint materials. The samples shall be taken in the presence of the Contracting Officer, and labeled, identifying each sample. Provide labels in accordance with the paragraph "Packaging, Labeling, and Storage" of this specification.

1.4.1.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph "Qualification Testing" laboratory for coatings. The qualification testing lab report shall include the backup data and summary of the test results. The summary shall list all of the reference specification requirements and the result of each test. The summary shall clearly indicate whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If the Contractor chooses MPI to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

1.5 REGULATORY REQUIREMENTS

1.5.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.5.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.4 Asbestos Content

Materials shall not contain asbestos.

1.5.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

1.5.6 Human Carcinogens

Materials shall not contain ACGIH Limit Values and ACGIH TLV-DOC confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.6 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F.

1.7 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01525, "Safety Requirements" and in Appendix A of EM 385-1-1. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.8 ENVIRONMENTAL CONDITIONS

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

1.9 COLOR SELECTION

Colors of finish coats shall be as indicated or specified. Where not indicated or specified, colors shall be selected by the Contracting Officer. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

Color, texture, and pattern of wall coating systems shall be as indicated.

1.10 LOCATION AND SURFACE TYPE TO BE PAINTED

1.10.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.
- c. Existing coated surfaces that are damaged during performance of the work.

1.10.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, and existing uncoated surfaces, of the buildings and appurtenances as indicated. Also included are existing coated surfaces made bare by cleaning operations.

1.10.1.2 Interior Painting

Includes new surfaces, existing uncoated surfaces, and existing coated surfaces of the buildings and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

- a. Other contiguous surfaces.

1.10.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.

- c. Steel to be embedded in concrete.
- d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- e. Hardware, fittings, and other factory finished items.

1.10.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new and existing surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
 - (1) Exposed piping, conduit, and ductwork;
 - (2) Supports, hangers, air grilles, and registers;
 - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
 - (1) New zinc-coated, aluminum, and copper surfaces under insulation
 - (2) New aluminum jacket on piping
 - (3) New interior ferrous piping under insulation.

1.10.4 Definitions and Abbreviations

1.10.4.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.10.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

1.10.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (metals, plastics, wood, paper, leather, cloth, etc.). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendering, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.10.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.10.4.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.10.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.10.4.7 EXT

MPI short term designation for an exterior coating system.

1.10.4.8 INT

MPI short term designation for an interior coating system.

1.10.4.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.10.4.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.10.4.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.10.4.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D 523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.10.4.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.10.4.14 Paint

See Coating definition.

1.10.4.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.10.4.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 RESEALING OF EXISTING EXTERIOR JOINTS

3.2.1 Surface Condition

Surfaces shall be clean, dry to the touch, and free from frost and moisture; remove grease, oil, wax, lacquer, paint, defective backstop, or other foreign matter that would prevent or impair adhesion. Where adequate grooves have not been provided, clean out to a depth of 1/2 inch and grind to a minimum width of 1/4 inch without damage to adjoining work. Grinding shall not be required on metal surfaces.

3.2.2 Backstops

In joints more than 1/2 inch deep, install glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free of oil or other staining elements as recommended by sealant manufacturer. Backstop material shall

be compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

3.2.3 Primer and Bond Breaker

Install the type recommended by the sealant manufacturer.

3.2.4 Ambient Temperature

Between 38 degrees F and 95 degrees F when applying sealant.

3.2.5 Exterior Sealant

For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T. Color(s) shall be selected by the Contracting Officer. Apply the sealant in accordance with the manufacturer's printed instructions. Force sealant into joints with sufficient pressure to fill the joints solidly. Sealant shall be uniformly smooth and free of wrinkles.

3.2.6 Cleaning

Immediately remove fresh sealant from adjacent areas using a solvent recommended by the sealant manufacturer. Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean condition. Allow sealant time to cure, in accordance with manufacturer's recommendations, prior to coating.

3.3 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, disintegrated coatings, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.3.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

- a. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, ASTM D 235. Allow surface to dry. Wiping shall immediately precede the application of the first coat of any coating, unless specified otherwise.
- b. Sand existing glossy surfaces to be painted to reduce gloss. Brush, and wipe clean with a damp cloth to remove dust.
- c. The requirements specified are minimum. Comply also with the

application instructions of the paint manufacturer.

- d. Previously painted surfaces specified to be repainted or damaged during construction shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter.
- e. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed.
- f. Chalk shall be removed so that when tested in accordance with ASTM D 4214, the chalk resistance rating is no less than 8.
- g. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas.
- h. Edges of chipped paint shall be feather edged and sanded smooth.
- i. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting.
- j. New, proposed coatings shall be compatible with existing coatings.

3.3.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding or blasting so that when tested in accordance with ASTM D 4214, the chalk rating is not less than 8.

3.3.3 Removal of Existing Coatings

Remove existing coatings from the following surfaces:

- a. Surfaces containing large areas of minor defects;
- b. Surfaces containing more than 20 percent peeling area; and
- c. Surfaces designated by the Contracting Officer, such as surfaces where rust shows through existing coatings.

3.3.4 Substrate Repair

- a. Repair substrate surface damaged during coating removal;
- b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal; and
- c. Clean and prime the substrate as specified.

3.4 PREPARATION OF METAL SURFACES

3.4.1 Existing and New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances:

Solvent clean or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 3; Water jetting to SSPC SP 12 WJ-4 may be used to remove loose coating and other loose materials. Use inhibitor as recommended by coating manufacturer to prevent premature rusting. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

- b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 6/SSPC SP 12 WJ-3.

3.4.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 3.

For abrasive blast cleaned surfaces, the requirements are stated in SSPC SP 7, SSPC SP 6, and SSPC SP 10. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 1.

For waterjet cleaned surfaces, the requirements are stated in SSPC SP 12. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 4.

3.4.3 Galvanized Surfaces

- a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with SSPC SP 1. If the galvanized metal has been passivated or stabilized, the coating shall be completely removed by brush-off abrasive blast. New galvanized steel to be coated shall not be "passivated" or "stabilized" If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D 2092, Appendix X2, and remove by one of the methods described therein.
- b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to SSPC SP 12 WJ3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.

3.4.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

- a. Surface Cleaning: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.4.5 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, ASTM D 235. Wipe dry with clean, dry cloths.

3.4.6 Existing Surfaces with a Bituminous or Mastic-Type Coating

Remove chalk, mildew, and other loose material by washing with a solution of 1/2 cup trisodium phosphate, 1/4 cup household detergent, one quart 5 percent sodium hypochlorite solution and 3 quarts of warm water.

3.5 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.5.1 Concrete and Masonry

- a. Curing: Concrete, stucco and masonry surfaces shall be allowed to cure at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting.
- b. Surface Cleaning: Remove the following deleterious substances.
 - (1) Dirt, Chalking, Grease, and Oil: Wash new and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.
 - (2) Fungus and Mold: Wash new, existing coated, and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.
 - (3) Paint and Loose Particles: Remove by wire brushing.
 - (4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.
- c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.
- d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D 4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F 1869. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.5.2 Gypsum Board, Plaster, and Stucco

- a. Surface Cleaning: Plaster and stucco shall be clean and free from loose matter; gypsum board shall be dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint will be water-based.

- b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.
- c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D 4263. New plaster to be coated shall have a maximum moisture content of 8 percent, when measured in accordance with ASTM D 4444, Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.6 PREPARATION OF WOOD AND PLYWOOD SURFACES

3.6.1 New, Existing Uncoated, and Existing Coated Plywood and Wood Surfaces, Except Floors:

- a. Wood surfaces shall be cleaned of foreign matter.

Surface Cleaning: Surfaces shall be free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood. Scrape to remove loose coatings. Lightly sand to roughen the entire area of previously enamel-coated wood surfaces.
- b. Removal of Fungus and Mold: Wash existing coated surfaces with a solution composed of 3 ounces (2/3 cup) trisodium phosphate, 1 ounce (1/3 cup) household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.
- c. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter in accordance with ASTM D 4444, Method A, unless otherwise authorized.
- d. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints.
- e. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.
- f. Cosmetic Repair of Minor Defects:
 - (1) Knots and Resinous Wood and Fire, Smoke, Water, and Color Marker Stained Existing Coated Surface: Prior to application of coating, cover knots and stains with two or more coats of 3-pound-cut shellac varnish, plasticized with 5 ounces of castor oil per gallon. Scrape away existing coatings from knotty areas, and sand before treating. Prime before applying any putty over shellacked area.
 - (2) Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.
 - (3) Checking: Where checking of the wood is present, sand the surface, wipe and apply a coat of pigmented orange shellac. Allow

to dry before paint is applied.

- g. Prime Coat For New Exterior Surfaces: Prime coat wood doors, windows, frames, and trim before wood becomes dirty, warped, or weathered.

3.6.2 Wood Floor Surfaces, Natural Finish

- a. Initial Surface Cleaning: As specified in paragraph entitled "Surface Preparation."
- b. Existing Loose Boards and Shoe Molding: Before sanding, renail loose boards. Countersink nails and fill with an approved wood filler. Remove shoe molding before sanding and reinstall after completing other work. At Contractor's option, new shoe molding may be provided in lieu of reinstalling old. New wood molding shall be same size, wood species, and finish as the existing.
- c. Sanding and Scraping: Sanding of wood floors is specified in Section 09640A WOOD STRIP FLOORING. Floors of oak or similar open-grain wood shall be filled with wood filler recommended by the finish manufacturer and the excess filler removed.
- d. Final Cleaning: After sanding, sweep and vacuum floors clean. Do not walk on floors thereafter until specified sealer has been applied and is dry.

3.6.3 Interior Wood Surfaces, Stain Finish

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth.

3.6.4 Water Blasting of Existing Coated Wood Surfaces:

Water blasting shall be provided for the following surfaces: Exterior wood trim to remain.

- a. Sample Panel: Prior to the initial surface cleaning, water blast a representative surface designated by the Contracting Officer. Final surface condition of remaining work shall be similar to sample panel approved by the Contracting Officer.
- b. Initial Surface Cleaning: Water blasting shall consist of washing surfaces to receive paint with a high pressure spray, to remove loose paint, dirt, and other foreign or deleterious materials. The working pressure shall be between 400 and 700 pounds per square inch gage (psig) at a nozzle operating rate of a minimum 20 gallons per minute (g/min.). Do not flood vents or damage windows and floors. If the pressure specified will cause damage to existing wood, advise the Contracting Officer and obtain permission to vary the pressure. Direct the wash nozzle at the surface at an angle of approximately 75 degrees with the surface and at a distance not greater than 5 feet to apply water pressure required to remove loose paint, dirt, chalking, and other foreign matter.
- c. Final Surface Cleaning: After allowing the surfaces to dry for a minimum of 24 hours, remove remaining dirt, splinters, loose

particles, disintegrated and loose paint, grease, oil, and other foreign matter from the surface.

3.7 APPLICATION

3.7.1 Coating Application

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated.

Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free before and during the application of coating material.

3.7.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. The written permission shall include quantities and types of thinners to use.

3.7.3 Coating Systems

- a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table

Division 3.	Exterior Concrete Paint Table
Division 4.	Exterior Concrete Masonry Units Paint Table
Division 5.	Exterior Metal, Ferrous and Non-Ferrous Paint Table
Division 6.	Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table
Division 9:	Exterior Stucco Paint Table

Division 3. Interior Concrete Paint Table
Division 4. Interior Concrete Masonry Units Paint Table
Division 5. Interior Metal, Ferrous and Non-Ferrous Paint Table
Division 6. Interior Wood Paint Table
Division 9: Interior Plaster, Gypsum Board, Textured Surfaces
Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
 - (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.8 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.
- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer

MPI 107.

3.9 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

3.10 COATING SYSTEMS FOR WOOD AND PLYWOOD

- a. Apply coatings of Tables in Division 6 for Exterior and Interior.
- b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after erection.
- c. Apply stains in accordance with manufacturer's printed instructions.
- d. Wood Floors to Receive Natural Finish: Thin first coat 2 to 1 using thinner recommended by coating manufacturer. Apply all coatings at rate of 300 to 350 square feet per gallon. Apply second coat not less than 2 hours and not over 24 hours after first coat has been applied. Apply with lambs wool applicators or roller as recommended by coating manufacturer. Buff or lightly sand between intermediate coats as recommended by coating manufacturer's printed instructions.

3.11 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.12 PAINT TABLES

All DFT's are minimum values.

3.12.1 EXTERIOR PAINT TABLES

DIVISION 3: EXTERIOR CONCRETE PAINT TABLE

- A. New and uncoated existing and Existing, previously painted concrete; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:

1. Latex

New; MPI EXT 3.1A-G2 (Flat) / Existing; MPI REX 3.1A-G2 (Flat)		
Primer:	Intermediate:	Topcoat:
MPI 10	MPI 10	MPI 10
System DFT:	3.5 mils	

Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE

- A. New and Existing concrete masonry on uncoated surface:

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE

1. Latex

New; MPI EXT 4.2A-G1 (Flat) / Existing; MPI REX 4.2A-G1 (Flat)			
Block Filler:	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 10	MPI 10
System DFT: 11 mils			

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

STEEL / FERROUS SURFACES

A. New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3

1. Alkyd

New; MPI EXT 5.1Q-G5 (Semigloss) Existing; MPI REX 5.1D-G5		
Primer:	Intermediate:	Topcoat:
MPI 23	MPI 94	MPI 94
System DFT: 5.25 mils		

EXTERIOR GALVANIZED SURFACES

B. New Galvanized surfaces:

1. MPI EXT 5.3A-G1 (Flat)

MPI 26	MPI 10	MPI 10
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MPI EXT 5.3A-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 26	MPI 11	MPI 11
System DFT: 4.5 mils		

EXTERIOR SURFACES, OTHER METALS (NON-FERROUS)

I. Aluminum, aluminum alloy and other miscellaneous non-ferrous metal items not otherwise specified except hot metal surfaces, roof surfaces, and new prefinished equipment. Match surrounding finish:

1. MPI EXT 5.4F-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 94	MPI 94
System DFT: 5 mils		

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE

A. New and Existing, uncoated Dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors not otherwise specified:

1. Alkyd

MPI EXT 6.3B-G5 (Semigloss)		
Primer:	Intermediate:	Topcoat:
MPI 7	MPI 94	MPI 94
System DFT: 5 mils		

DIVISION 9: EXTERIOR STUCCO PAINT TABLE

A. New and Existing stucco:

1. Latex

New; MPI EXT 9.1A-G1 (Flat) / Existing; MPI REX 9.1A-G2 (Flat)

Primer: Intermediate: Topcoat:

MPI 10 MPI 10 MPI 10

System DFT: 4.5 mils

3.12.2 INTERIOR PAINT TABLES

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

A. New and uncoated existing and Existing, previously painted Concrete, vertical surfaces, not specified otherwise:

1. Latex

New; MPI INT 3.1A-G2 (Flat) / Existing; MPI RIN 3.1A-G2 (Flat)

Primer: Intermediate: Topcoat:

MPI 50 MPI 44 MPI 44

System DFT: 4 mils

B. New and uncoated existing and Existing, previously painted concrete floors in following areas: Entry porches and steps.

1. Alkyd Floor Paint

New; MPI INT 3.2B-G2 (Flat) / Existing; MPI RIN 3.2B-G2 (Flat)

Primer: Intermediate: Topcoat:

MPI 59 MPI 59 MPI 59

System DFT: 5 mils

2. Epoxy

New; MPI INT 3.2C-G6 (Gloss) / Existing; MPI RIN 3.2C-G6 (Gloss)

Primer: Intermediate: Topcoat:

MPI 77 MPI 77 MPI 77

System DFT: 5 mils

Note: Primer may be reduced for penetration per manufacturer's instructions.

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New and uncoated Existing Concrete masonry:

1. MPI INT 4.2D-G3 (Eggshell)

Filler Primer: Intermediate: Topcoat:

MPI 4 N/A MPI 139 MPI 139

System DFT: 11 mils

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

A. Metal, Mechanical, Electrical, Surfaces adjacent to painted surfaces (Match surrounding finish), exposed copper piping, and

INTERIOR STEEL / FERROUS SURFACES

miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. MPI INT 5.1R-G3 (Eggshell)
Primer: Intermediate: Topcoat:
MPI 79 MPI 139 MPI 139
System DFT: 5 mils

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New and Existing, uncoated Wood and plywood not otherwise specified:

1. High Performance Architectural Latex
MPI INT 6.4S-G3 (Eggshell)
Primer: Intermediate: Topcoat:
MPI 39 MPI 139 MPI 139
System DFT: 4.5 mils

B. New and Existing, previously finished or stained Wood and Plywood, except floors; natural finish or stained:

1. Natural finish, oil-modified polyurethane
New; MPI INT 6.4J-G4 / Existing; MPI RIN 6.4L-G4
Primer: Intermediate: Topcoat:
MPI 57 MPI 57 MPI 57
System DFT: 4 mils

C. New and Existing, previously finished or stained Wood Floors; Natural finish or stained:

1. Natural finish, Moisture Cured Polyurethane
New; MPI INT 6.5K-G6 (Semi-Gloss)/ Existing; MPI RIN 6.5D-G6 (Semi-Gloss)
Primer: Intermediate: Topcoat:
MPI 31 MPI 31 MPI 31
System DFT: 4 mils

D. New and Existing, uncoated Wood Doors; Pigmented finish:

1. Alkyd
New; MPI INT 6.3B-G5 (Semigloss)
Primer: Intermediate: Topcoat:
MPI 45 MPI 47 MPI 47
System DFT: 4.5 mils

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

A. New and Existing, previously painted Plaster and Wallboard not otherwise specified:

1. New; MPI INT 9.2A-G3 (Eggshell) / Existing; RIN 9.2A-G3 (Eggshell)
Primer: Intermediate: Topcoat:
MPI 50 MPI 52 MPI 52
System DFT: 4 mils

B. New and Existing, previously painted Plaster and Wallboard in

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE
kitchens, bathrooms, and laundry areas:

1. Alkyd

New; MPI INT 9.2C-G5 (Semigloss) / Existing; MPI RIN 9.2C-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
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MPI 50	MPI 47	MPI 47
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System DFT: 4 mils

-- End of Section --

SECTION 09995

PREPARATION OF HISTORIC WOOD AND METAL SURFACES FOR PAINTING
01/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH Limit Values	(1997) Threshold Limit Values for Chemical Substances and Physical Agents Biological Exposure Indices
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1730	(1967; R 1993) Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting
ASTM D 1731	(1967; R 1993) Preparation of Hot-Dip Aluminum Surfaces for Painting
ASTM D 3274	(1995) Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
ASTM D 3359	(1995a) Measuring Adhesion by Tape Test
ASTM D 4214	(1997) Evaluating Degree of Chalking of Exterior Paint Films

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA Guide 5	(1990) Guide to Maintenance Painting Programs
SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 2	(1995) Hand Tool Cleaning
SSPC SP 3	(1995) Power Tool Cleaning
SSPC SP 5	(1994) White Metal Blast Cleaning

1.2 WORK PLAN

The procedures proposed for the accomplishment of the work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, and coordination with other work in progress. The work plan

shall include a Safety and Health plan describing procedures for handling monitoring, and disposition of VOCs and other hazardous and toxic materials. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations. The Contractor shall test the materials designated by the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan

Four copies of the Work Plan.

Materials

The names, quantity represented, and intended use for proprietary brands of materials proposed to be substituted for the specified materials when the required quantity of a particular batch is 50 gallons or less.

Manufacturer's current printed product description, material safety data sheets (MSDS) and technical data sheets for each product. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times shall be provided for each product submitted.

Qualifications

A statement certified by the Contractor attesting that the experience and qualifications of the workers (journeymen) comply with the specifications.

SD-07 Certificates

Work Plan

Certificate stating that products proposed for use meet the VOC regulations of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located.

1.4 PACKAGING, LABELING, AND STORING

Paint removers, solvents, and other chemicals used for surface preparation shall be in sealed containers that legibly show the designated name, formula or specification number, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Such materials shall be furnished in containers not larger than 5 gallons; they shall be stored in accordance with the manufacturer's written directions; and as a minimum stored off the ground, under cover, with sufficient ventilation to

prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F.

1.5 ENVIRONMENTAL CONDITIONS

Unless otherwise recommended by the product manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying paint removers, solvents, or other preparation materials.

1.6 SAFETY AND HEALTH

Work shall comply with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in the CONTRACT CLAUSES. The Activity Hazard Analysis shall include analyses of the potential impact of surface preparation operations on personnel and on others involved in and adjacent to the work zone.

1.6.1 Worker Exposures

Exposure of workers to chemical substances shall not exceed limits as established by ACGIH Limit Values.

1.6.2 Training

Workers having access to an affected work area shall be informed of the contents of the applicable material data safety sheets (MSDS) and shall be informed of potential health and safety hazard and protective controls associated with materials used on the project. An affected work area is one which may receive dust, mists, and odors from the surface preparation operations. Workers involved in surface preparation and clean-up shall be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

1.6.3 Coordination

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from surface preparation and cleaning operations.

1.7 QUALIFICATIONS

The Contractor shall provide qualified workers trained and experienced in the preparation for painting of wood and metal surfaces in historic structures and shall submit documentation of 5 consecutive years of work of this type. A list of similar jobs shall be provided identifying when, where, and for whom the work was done. A current point-of-contact for identified references shall be provided.

PART 2 PRODUCTS

2.1 PAINT REMOVERS

Chemical paint removers shall be a commercial item specifically manufactured for the type of paint to be removed.

2.2 EPOXY CONSOLIDANTS

2.2.1 Liquid Consolidant

Liquid wood consolidant shall consist of a 2-part, low-viscosity liquid epoxy that meets the criteria of Table 1.

2.2.2 Epoxy Paste

Epoxy paste shall consist of a 2-part, thixotropic paste that meets the criteria of Table 1.

TABLE 1

	LIQUID CONSOLIDANT	EPOXY PASTE
Properties	Low-Viscosity Liquid	No-Slump, Thixotropic Paste
Toxicity	Low	Very Low
Toxicity Cured	Non-Toxic	Non-Toxic
Ratios	1:1 by Volume	1:1 by Volume
Pot Life @ Room Temp.	30 minutes min.	50 minutes min.
Hardening @ Room Temp.	1 hr. or longer	1 hr. or longer
Hardening @ 140 deg. F	16 min. or less	18 min. or less
Viscosity Poises @ 72 deg. F	4.7 max.	Thixotropic paste
Solids	95 percent min.	98 percent min.
Tensile Strength	4000 psi	2500 psi
Elongation	50 percent	4 percent
Compressive Strength		
Failure	19000 psi	---
Yield	3500 psi	5500 psi

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Methods used for preparation of historic wood and metal surfaces for painting shall be the gentlest possible to achieve the desired results. Historic substrate materials shall not be damaged or marred in the process of surface preparations. Samples of the existing paint finishes shall be collected and analyzed for the purpose of documentation or matching, if so directed by the Contracting Officer. Material and application requirements for paints are covered in Section 09900 PAINTING, GENERAL.

3.2 VENTILATION

Interior work zones having a volume of 10,000 cubic feet or less shall be

ventilated at a minimum of 2 air exchanges per hour. Ventilation in larger work zones shall be maintained by means of mechanical exhaust. Solvent vapors shall be exhausted outdoors, away from air intakes and workers. Return air inlets in the work zone shall be temporarily sealed before start of work until the prepared surfaces have dried. Operators and personnel in the vicinity of paint removal processes involving chemicals or mechanical action (sanding or blasting) shall wear respirators.

3.3 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workers skilled in the trades involved shall reinstall removed items. Surfaces contaminated by preparation materials shall be restored to original condition.

3.4 CLEANING OF SURFACES

Surfaces to be painted shall be clean and free of grease, dirt, dust and other foreign matter before application of paint or surface treatments. After cleaning, surfaces shall exhibit a surface disfigurement rating of 7 or greater when evaluated in accordance with ASTM D 3274. Dirt and surface contaminants shall be cleaned by brush with solutions of water and detergent or trisodium phosphate, then rinsed clean with water and let dry.

Surfaces on which mildew or other microbiological growth is present shall be cleaned with a detergent solution containing household bleach. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on newly prepared or newly painted surfaces.

3.5 EXISTING PAINT

Existing paint shall be tested for adhesion to substrate per ASTM D 3359, Test Method A and shall obtain a rating of 4 or better in order to be considered sound. Existing paint meeting this requirement may be considered a satisfactory base for repainting.

3.6 PAINT REMOVAL

Flaking, cracking, blistering, peeling or otherwise deteriorated paint shall be removed by scraping with hand scrapers. After scraping, removal of large areas of paint or paint on architectural details shall be accomplished using sanders, heat guns or heat plates, or chemical paint removers. Paint shall be removed to bare substrate or first sound paint layer. Open flame heat devices shall not be used. Mechanical paint removal shall not damage or mar the substrate material.

3.6.1 Chemical Paint Removers

Chemical paint removers shall be used in accordance with manufacturer's recommendations. If chemical strippers are used, substrate shall be neutralized after stripping to a pH of 5 to 8.5.

3.6.2 Lead Paint

In preparation of lead-based painted surfaces for repainting, procedures described in Section 13281 LEAD HAZARD CONTROL ACTIVITIES shall be followed.

3.7 SURFACE PREPARATION

After cleaning and removal of deteriorated paint, edges of remaining chipped paint shall be feather-edged and sanded smooth. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas. Slick surfaces shall be roughened. Rusty metal surfaces shall be cleaned per SSPC SP 3. Chalk shall be removed so that when tested in accordance with ASTM D 4214, the chalk resistance rating is no less than 8. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

3.8 WOOD SURFACES

Wood surfaces shall be cleaned of foreign matter. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints. Small, dry seasoned knots shall be scraped, cleaned, and given a thin coat of commercial knot sealer before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or, if it is still soft, removed with mineral spirits or turpentine, and the resinous area shall be thinly coated with knot sealer.

3.8.1 Interior Wood Surfaces

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler recommended by the finish manufacturer not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth. Sanding of wood floors is specified in Section 09640 WOOD STRIP FLOORING. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter, unless otherwise authorized.

3.8.2 Wood Repair

Badly decayed areas shall be removed and repaired. Areas and pieces decayed beyond repair shall be replaced with new pieces that match originals in all respects. Moderately decayed areas, weathered, or gouged wood shall be patched with approved patching compounds, and shall be sanded smooth. The source or cause of wood decay shall be identified and corrected prior to application of patching materials. Wet wood shall be completely dried to a moisture content not exceeding 12 percent, as measured by a moisture meter, to its full depth before patching, unless otherwise authorized. Wood that is to be patched shall be clean of dust, grease, and loose paint.

3.8.2.1 Epoxy Wood Repair

Epoxy wood repair materials shall be applied in accordance with manufacturer's written instructions. Health and safety instructions shall be followed in accordance with the manufacturer's instructions. Clean mixing equipment shall be used to avoid contamination. Mix and proportions shall be as directed by the manufacturer. Batches shall be only large enough to complete the specific job intended. Patching materials shall be completely cured before painting or reinstallation of patched pieces.

3.8.2.2 Epoxy Consolidant and Epoxy Paste

Epoxy liquid wood consolidant shall be used: 1) to penetrate and impregnate deteriorated wood sections in order to reinforce wood fibers that have become softened or absorbent. 2) as a primer for areas that are to receive epoxy paste filler. Epoxy paste shall be used to fill areas where portions of wood are missing such as holes, cracks, gaps, gouges, and other voids.

3.8.3 Exposed Ferrous Metals

Exposed ferrous metals such as nail heads on or in contact with wood surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.8.4 Finishing Nails

Finishing nails shall be set, and all holes and surface imperfections shall be primed. After priming, holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sanded smooth. Putty or wood filler shall be compatible with subsequent coatings.

3.8.5 Wood Preservative

Areas of bare wood in exterior locations prone to excessive moisture or standing water shall be treated with a commercial, fungicide, paintable water repellant/preservative. Water repellant/preservatives shall not be used on interior surfaces.

3.9 METAL SURFACES

Metal surfaces shall be cleaned of foreign matter. Programs for preparation of metal shall be per SSPC PA Guide 5. Grease, oil, and other soluble contaminants shall be removed by solvent cleaning per SSPC SP 1. Surfaces shall be free from soils and corrosion; e.g. grease, oil, solder flux, welding flux, weld spatter, sand, rust, scale, and other contaminants that might interfere with the application of the new finish. Cleaning methods shall be the gentlest possible to achieve the desired result. Metals which are soft, thin, or exhibit fine detail shall not be abrasively cleaned. Evidence of corrosion or contamination on a previously cleaned surface shall be cause for recleaning prior to painting.

3.9.1 Ferrous Surfaces

Ferrous surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools according to SSPC SP 2, power tools according to SSPC SP 3 or by blast cleaning according to SSPC SP 5. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

3.9.2 Nonferrous Metallic Surfaces

Galvanized, aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces shall be solvent-cleaned in accordance with SSPC SP 1.

3.9.2.1 Aluminum

Aluminum surfaces shall be treated per ASTM D 1730 or ASTM D 1731. Steel wool, steel brushes and uninhibited caustic etching solutions, such as sodium hydroxide, shall not be used on aluminum.

3.9.2.2 Zinc

Zinc surfaces including zinc-coated substrates, shall be cleaned prior to painting as follows: degrease, soak in a mild and inhibited alkaline cleaner, rinse with clean overflowing water, clean anodically in an acid (e.g. 0.25 to 0.75 percent sulfuric acid), and rinse with clean overflowing water.

3.10 TIMING

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Unless otherwise directed, the first coat primer shall be applied within 48 hours of surface preparation.

3.11 SURFACES TO BE PREPARED FOR PAINTING

Surfaces shall be prepared as specified and as shown in the painting schedule in Section 09900 PAINTS AND COATINGS.

3.12 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Containers shall be removed from the site or destroyed in an approved manner. Preparation materials and other deposits on adjacent surfaces shall be removed and the entire job left clean and ready for painting.

-- End of Section --

SECTION 10201N

METAL WALL LOUVERS

09/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 603.8 (1992; Addendum 1993) Pigmented Organic Coatings on Extruded Aluminum

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 500 (1991) Louvers, Dampers and Shutters

AMCA 511 (1991) Certified Ratings Program for Air Control Devices

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 653/A 653M (1998) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B 209 (1996) Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221 (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Wall louvers

Show all information necessary for fabrication and installation of louvers. Indicate materials, sizes, thicknesses, fastenings, and profiles.

SD-04 Samples

Wall louvers; G

Door louvers; G

Colors of finishes shall closely approximate colors indicated. Where color is not indicated, submit the manufacturer's standard

colors to the Contracting Officer for selection.

1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers shall be free from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Galvanized Steel Sheet

ASTM A 653/A 653M, coating designation G90.

2.1.2 Aluminum Sheet

ASTM B 209, alloy 3003 or 5005 with temper as required for forming.

2.1.3 Extruded Aluminum

ASTM B 221, alloy 6063-T5 or -T52.

2.2 METAL WALL LOUVERS

Weather resistant type, with bird screens and gravity back draft dampers and made to withstand a wind load of not less than 30 pounds per square foot.

Wall louvers shall bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500 and AMCA 511.

The rating shall show a water penetration of 0.20 or less ounce per square foot of free area at a free velocity of 800 feet per minute.

2.2.1 Extruded Aluminum Louvers

Fabricated of extruded 6063-T5 or -T52 aluminum with a wall thickness of not less than 0.081 inch.

2.2.2 Screens and Frames

For aluminum louvers, provide 1/2 inch square mesh, 14 or 16 gage aluminum or 1/4 inch square mesh, 16 gage aluminum bird screening. For steel louvers, provide 1/2 inch square mesh, 12 or 16 gage zinc-coated steel; 1/2 inch square mesh, 16 gage copper; or 1/4 inch square mesh, 16 gage zinc-coated steel or copper bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.3 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers and zinc-coated or stainless steel screws and fasteners for steel louvers. Provide other accessories as required for complete and proper installation.

2.4 FINISHES

2.4.1 Aluminum

Provide factory-applied organic coating.

2.4.1.1 Organic Coating

Clean and prime exposed aluminum surfaces and apply a baked enamel finish conforming to AAMA 603.8, 0.8 mil minimum dry film thickness, color to match "Langley Brown."

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wall Louvers

Install using stops or moldings, flanges, strap anchors, or jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

3.1.2 Door Louvers

Install louvers in wood doors by using metal "Z" or "L" moldings. Fasten moldings to door with screws.

3.1.3 Screens and Frames

Attach frames to louvers with screws or bolts.

3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

3.2.1 Copper or Copper-Bearing Alloys

Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

3.2.2 Aluminum

Where aluminum contacts metal other than zinc, paint the dissimilar metal with a primer and two coats of aluminum paint.

3.2.3 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.2.4 Wood

Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

-- End of Section --

SECTION 10300

GAS LOGS
01/00

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Gas Logs

Data composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. Provide pictures of the gas logs.

1.2 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one-year period shall be provided.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Materials shall be kept dry, protected from weather, and stored under cover in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GAS LOGS

Gas logs shall be provided in existing fireplaces where indicated. Gas logs shall be the vent-free type and shall be single burner. Size shall be 22 inches width by 11 inches depth for SOQ's and 18 inches width by 9 inches depth for EQ's. Maximum BTU per hour input shall be 40,000. Gas logs shall be manually operated. Gas log operation shall not require electricity. Gas logs shall be equipped with oxygen depletion sensor (ODS) for safety operation. Style shall be split oak. Provide piezo-ignitor for easy pilot lighting. Logs shall be ceramic-bonded, steel-reinforced, refractory type for superior reproduction of bark detail and long life. Log set shall include a bag of volcanic ash.

PART 3 EXECUTION

3.1 INSTALLATION

All installation and set-up of gas log sets shall be in accordance with

manufacturer's instructions and recommendations. The Contractor shall take complete measurements of the existing fireplaces to verify that the gas logs are suitable size for the existing fireplaces.

-- End of Section --

SECTION 10800A

TOILET ACCESSORIES

04/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 1036 (1991; R 1997) Flat Glass

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (1994) Safety Glazing Materials Used in Buildings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Finishes
Accessory Items
Frameless Shower Enclosure

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

SD-04 Samples

Finishes; G
Accessory Items; G

One sample of each accessory proposed for use. Approved samples may be incorporated into the finished work, provided they are identified and their locations noted.

1.3 DELIVERY, STORAGE, AND HANDLING

Toilet accessories shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area protected from construction damage and vandalism.

1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

Toilet accessories shall be provided where indicated in accordance with paragraph SCHEDULE. Porcelain type, tile-wall accessories are specified in Section 09310A CERAMIC TILE. Each accessory item shall be complete with the necessary mounting plates and shall be of sturdy construction with corrosion resistant surface.

2.1.1 Anchors and Fasteners

Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be suited for use with the supporting construction. Exposed fasteners shall have oval heads and shall be finished to match the accessory.

2.1.2 Finishes

Except where noted otherwise, finishes on metal shall be provided as follows:

<u>Metal</u>	<u>Finish</u>
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, bright

2.2 ACCESSORY ITEMS

Accessory items shall conform to the requirements specified below.

2.2.1 Medicine Cabinet (MC)

Medicine cabinet shall be constructed with cold-rolled carbon steel sheet of not less than .03 inch thick, formed from a single sheet of steel or shall have mechanically formed spot welded or any other suitable joints. Width, height and depth of cabinet shall be in accordance with paragraph SCHEDULE.

2.2.1.1 Swinging Door Cabinet, Class 2

Swinging door cabinet assembly including the lighting arrangement shall be as indicated. Assembly shall be recess mounted. Cabinet shall be located centrally behind the door and shall contain a minimum of two shelves. Door hinges shall be stainless steel or carbon steel. Magnets used in door catches shall be permanent type. Doors shall be with a mirror.

2.2.2 Mirrors, Glass (MG)

Glass for mirrors shall be Type I transparent flat type, Class 1-clear. Glazing Quality q1 1/4 inch thick conforming to ASTM C 1036. Glass shall

be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating shall be highly adhesive pure silver coating of a thickness which shall provide reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, and shall be free of pinholes or other defects. Copper protective coating shall be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and shall be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint shall consist of two coats of special scratch and abrasion-resistant paint and shall be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.2.2.1 Mirror Accessories

- a. Mirror Frames: Mirrors shall be provided with mirror frames (J-mold channels) fabricated of one-piece roll-formed Type 304 stainless steel with No. 4 brushed satin finish and concealed fasteners which will keep mirrors snug to wall. Frames shall be 1-1/4 x 1/4 inch continuous at top and bottom of mirrors. Concealed fasteners of type to suit wall construction material shall be provided with mirror frames.
- b. Mirror Clips: Concealed fasteners of type to suit wall construction material shall be provided with clips.

2.2.3 Towel Bar (MTB)

Towel bar shall have a minimum wall thickness of .015 inch. Bar shall be minimum 3/4 inch diameter, or 5/8 inch square. Style of towel bars shall be Taymor, Bellissima Collection, white porcelain base with chrome accents or approved equal.

2.2.4 Toilet Tissue Dispenser (MTTD)

Toilet tissue holder shall be Type II - surface mounted with one roll of standard tissue. Style and material of toilet tissue dispensers shall be Taymor, Bellissima Collection, white porcelain base with chrome accents or approved equal.

2.2.5 Towel Ring (MTR)

Towel ring shall be Taymor, Bellissima Collection, white porcelain base with chrome accents or approved equal.

2.2.6 Bypass Bath and Shower Door (BSD)

Bypass bath and shower door shall be width as required by width of bathtub. Height of door shall be approximately 56 inches. Glass shall be frosted tempered, not less than 1/4 inch thick. Frame components shall be extruded aluminum with bright silver finish. Door shall be Kohler Focal Bypass Bath and Shower Door number K7010 or approved equal.

2.3 FRAMELESS SHOWER ENCLOSURE

Glass shall be 3/8 inch thick, clear, tempered safety glazing, conforming to ANSI Z97.1. Framing members and hardware shall be polished, solid brass. Provide continuous brass tracks at top and bottom of glass and where glass abuts walls or partitions. Brass tracks shall not be provided at vertical joints between glass panels. Provide mitered glass at vertical

joints between glass panels. Provide complete door hardware including back to back "C" handles, 8 inches high by 3/4 inch diameter and deluxe pivot hinges. All hardware shall be supplied with bushings, gaskets, washers, and brass screws as necessary or recommended for a complete installation. All joints shall be waterproof. Sealant shall be clear silicone as recommended by the manufacturer of the enclosure. Enclosure manufactured by Century Shower Door, Inc., Glasstec, complies with these specifications.

PART 3 EXECUTION

3.1 INSTALLATION

Toilet accessories shall be securely fastened to the supporting construction in accordance with the manufacturer's approved instructions. Accessories shall be protected from damage from the time of installation until acceptance. Mirror shall not be glued to the wall. **Frameless enclosures shall be installed in a true workmanlike manner, making all final adjustments.**

3.2 CLEANING

Material shall be cleaned in accordance with manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid scratching or marring of surfaces.

-- End of Section --

SECTION 11401N

ELECTRIC KITCHEN EQUIPMENT

09/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

UNDERWRITERS LABORATORIES INC. (UL)

UL 250 (1993; R 1998) Household Refrigerators and Freezers

UL 430 (1994; R 1996, Bul. 1996) Waste Disposers

UL 749 (1997) Household Dishwashers

UL 858 (1993; R 1999) Household Electric Ranges

1.2 RELATED REQUIREMENTS

Section 15400 PLUMBING, GENERAL PURPOSE and Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM apply to this section, with additions and modifications specified herein.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Kitchen equipment

SD-08 Manufacturer's Instructions

Kitchen equipment

1.4 LEVEL OF QUALITY

Manufacturer's names and model numbers are included in these specifications to clearly establish the level of quality which shall be provided. Appliances shall comply with all requirements in these specifications and shall be equal to the appliances which are indicated by manufacturer's names and model numbers.

PART 2 PRODUCTS

2.1 KITCHEN EQUIPMENT

2.1.1 Materials

Except as modified herein, provide manufacturer's standard materials for kitchen equipment. Provide quantities, physical dimensions, colors, and electrical characteristics as indicated.

2.1.2 Built-In Cooktops for SOQs

Built-in cooktop for GOQs shall comply with UL 858, and shall be 30 inches in width, downdraft, electric, four burners, downdraft ventilation, non-stick grille, infinite control settings, fixed radiant elements, variable-speed ventilation fan, one ultra quick-twin dual radiant element, three ultra quick-start radiant elements, wipe-clean glass-ceramic surface, hot surface light beside each element, backlit controls, pop-up fan knob, frameless design with polished rounded edges, color black. Built-in ovens Designer Line as manufactured by Jenn-Air complies with these specifications.

2.1.3 Refrigerators for Enlisted Quarters

The refrigerators for the Enlisted Quarters shall comply with UL 250, refrigerator with frostproof side by side freezer, minimum 21 cubic feet, automatic defrosting, two vegetable bottom baskets, four adjustable shelves, two door shelves and minimum 12 egg container in the door, separate interior shelves and multiple door shelves. Provide four fixed rollers or adjustable leg levelers. Provide ice makers in all refrigerators. Refrigerator Model No. TFX22CR as manufactured by General Electric complies with these specifications.

2.1.4 Refrigerators for SOQs

Refrigerators for GOQs shall comply with UL 250 unless otherwise noted and shall be minimum 25 cubic feet, contoured doors, in-door ice dispensing system, side by side frostproof freezer, ice and water filtration system, trimless in color black, total of four refrigerator shelves including two roll-out adjustable glass shelves, adjustable slide and lock 4 gallon door bins, two adjustable slide and lock can racks, automatic ice maker, two wire compartment shelves, three slide-out wire baskets, three door bins, refrigerator compartment size minimum 15 cubic feet, freezer compartment size minimum 15 cubic feet, total shelf area minimum 25 square feet, energy rating 35 percent, lighted interior, 115V, 60 Hz AC electrical requirements, convertible vegetable/meat locker, egg container, wine rack with 2 liter storage. Refrigerator Model No. KSRS251H as manufactured by Kitchenaid complies with these specifications.

2.1.5 Double Ovens for SOQs

Double ovens for GOQs shall have 30 inches width, electronic touch-through-glass keypad controls, curved glass styling, large panaview windows, flush-to-cabinet design, upper dual speed convection (convert bake/convect roost) and bake/broil oven with temperature probe, drying feature with special mesh drying rack, lower bake/broil oven, self-cleaning in both ovens, color black, electronic clock with timer, delay-start cooking and cleaning, variable temperature control broiling, heavy-duty oven racks, porcelain oven interior, catalytic smoke eliminator. Double ovens Model No. JJW9630 as manufactured by Jenn-Air complies with these specifications.

2.1.6 Range for Enlisted Quarters

UL 858, 30 inch slide-in combination cooking top range and oven. Cooking top shall be spill catching, seamless with tubular plug-in surface elements. Provide indicating "on" lights. Oven shall be self-cleaning. Equip with black glass window door, safety door lock during self-cleaning cycle, broiler pan, self locking oven racks, digital clock with one hour timer, automatic oven light, oven "on" indicator light, oven cycling light, and tempered glass control. Range Model No. JBP24BBWH as manufactured by General Electric complies with these specifications.

2.1.7 Range Hood for Enlisted Quarters

UL 858, vented, with two-speed fan, permanent washable filter, rear exhaust, and eye level controls. Range hood Model No. JV337X as manufactured by General Electric complies with these specifications.

2.1.8 Dishwasher for Enlisted Quarters

The dishwasher for the Enlisted Quarters shall comply with UL 749, with detergent dispenser. Provide automatic control to cycle machine through wash, rinse, dry or heat, and stop phases. Include manual setting to repeat or skip phases of cycle. Equip machine with safety switch which automatically stops spraying action when door is open. Provide household grade, with minimum 500-watt input for drying dishes. Dishwasher Model No. GSD2000FWH as manufactured by General Electric complies with these specifications.

2.1.9 Dishwashers for GOQs

Dishwashers for GOQs shall comply with UL 749 and shall be 24 inches wide, commercial grade stainless steel interior, door design with full-length frameless panel and soft-tough handle, 6 inch traditional console styling, 5 cycle selections and 4 cycle options (including sani-rinse option), hydro sweep 5-level wash system with upper spray arm, hard-food disposer and self-cleaning filter, automatic purge filtration wash system with pressure sensor and automatic temperature control. Sound insulation, 100 percent usable nylon-coated racks with cushion-tip tines, 14 place setting capacity, 2 inch adjustable upper rack with handle, 2 fold-down tine rows, utility cup and stemware holder, lower rack with extended 3/4 inch bull nose design and flexi-flip-away tines, culinary caddy utensil basket, verified to sanitize by NSF International, color black, usable capacity minimum 5.5 cubic feet. Dishwashers Model No. KUDR01TJ as manufactured by Kitchenaid complies with these specifications. Provide "quiet-design insulation package" for each dishwasher.

2.1.10 Ice Makers for GOQs

Ice makers for GOQs shall be size 34 inches high by 15 inches wide by 24 inches deep, shall produce up to 35 pounds of ice per day, store 35 pounds, automatic defrost, clip-on handles attached to door frames, clear ice maker with solid door, provide ice cubes of crystal clear, classic symmetrical shape which chills drinks and food presentations quickly and without sticking together, cubes to be size 3/4 inch and absolutely chewable, drain pump kit, capacity lighted storage bin, electronic clean cycle, up-front water valve, gravity flow outlet tube, odorless, taste-free cubes, black filler kit. Ice makers Model No. MAR-301M-R-W-WRPE as manufactured by Marvel Industries complies with these specifications.

2.1.11 Trash Compactors for GOQs

Trash compactors for GOQs shall be size 15 inches wide, 24 inches deep and 34 inches high and shall have sound conditioning, wraparound console, hidden removable key/knob control, automatic anti-jam, bag retainer buttons, tilt switch and tilt away trash basket, side release bin, wheels on back, wraparound drawer panel, freestanding convertible. Trash compactors Model No. GC900QPHB, color black as manufactured by Whirlpool complies with these specifications.

2.1.12 HOUSEHOLD GARBAGE DISPOSAL

UL 430, stainless steel continuous feed model, 3/4 hp motor, and stainless steel grinding element with two 360 degree stainless steel swivel impellers. Provide polyethylene or polyester drain flow chamber. Equip motor with manual reset, thermal overload protection, and sound insulation.

PART 3 EXECUTION

3.1 INSTALLATION

NFPA 70, Section 15400N PLUMBING, GENERAL PURPOSE and Section 16415A ELECTRICAL WORK, INTERIOR. Install kitchen equipment in accordance with manufacturers' instructions.

3.2 FIELD QUALITY CONTROL

Conduct inspection and testing in the presence of the Contracting Officer.

3.2.1 Field Inspection

Before and after installation, inspect each piece of kitchen equipment for compliance with specified requirements.

3.2.2 Operation Tests

Upon completion, but before final acceptance, perform operation tests on each piece of equipment to determine that components, including controls, safety devices, and attachments, operate properly and in accordance with specified requirements.

-- End of Section --

SECTION 12320

KITCHEN CABINETS AND VANITY CABINETS

11/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI QS (1997) Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA ANSI/BHMA A156.9 (1994) Cabinet Hardware

KITCHEN CABINET MANUFACTURERS ASSOCIATION (KCMA)

KCMA ANSI/KCMA A161.1 (1995) Recommended Performance & Construction Standards for Kitchen and Vanity Cabinets

HARDWOOD PLYWOOD & VENEER ASSOCIATION (HPVA)

ANSI/HPVA HP-1 (1994) Hardwood and Decorative Plywood

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (1995) High-Pressure Decorative Laminates

1.2 DESIGN

Cabinets shall be wood, factory-fabricated and finished in the manufacturer's standard sizes and finishes of the type, design, and configuration indicated. Cabinets shall be constructed as specified and shall meet the requirements of KCMA ANSI/KCMA A161.1. In addition, cabinets shall meet the requirements of (AWI QS) the AWI Architectural Woodwork Quality Standards, Section 400, Custom Grade **for Enlisted Quarters and Premium Grade for SOQs**. Wall and base cabinet assemblies shall consist of individual units joined into continuous sections. Fastenings shall be accomplished to permit removal and replacement of individual units without affecting the remainder of the installation. Counters shall be provided with watertight sink rim. Drawers shall be removable and shall be equipped with position stops to avoid accidental complete withdrawals. **All corners shall be mitered.**

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Cabinets and Countertops

Drawings showing each type of cabinet and related item, and clearly indicating the complete plan, location, and elevations of the cabinets and accessories and pertinent details of construction, fabrication, and attachments. Drawings shall indicate wood species for both solid wood and hardwood veneer plywood. Drawings shall indicate the thickness of all wood and plywood components and shall indicate which plywood is to be hardwood veneer and which plywood is to be softwood plywood.

SD-03 Product Data

Cabinets and Countertops

Manufacturer's printed data, catalog cuts, installation and cleaning instructions.

SD-04 Samples (See also the requirement for a sample cabinet in the Request for Proposal. This is not an additional sample; only one sample is required.)

Cabinets and Countertops; G.

Submit one (1) full size sample of finished base cabinet, minimum 35 inch length, with two drawers and cupboard below with adjustable shelf, complete with hardware, and without finished top. Provide stain/color samples approximately 2 x 3 inches in size.

Submit samples of each different countertop material specified complete with test results.

Samples and certificates approval requirements: Samples and certificates will be submitted to demonstrate Contractor's ability to furnish the required casework and furnishings in accordance with the specifications.

General Contractor shall not award subcontract to casework supplier until Contracting Officer has approved and submitted samples and certificates.

Acceptable sample units will be used for comparison inspection at the project. Sample units will be retained until completion and acceptance of the work.

Remove sample units from the premises when directed by the Contracting Officer after final completion of the installation and acceptance of the job.

SD-06 Test Reports

Cabinets and Countertops; G.

Test reports certifying that all cabinets comply with the requirements of

KCMA ANSI/KCMA A161.1. Tests shall be conducted by independent laboratories approved by KCMA. KCMA certification seals affixed to the cabinets will be accepted in lieu of certified test reports.

SD-07 Certificates

Cabinets and Countertops

Submit certification that the cabinets comply with the project specifications, with the requirements of KCMA ANSI/KCMA A161.1.

1.4 DELIVERY AND STORAGE

Cabinets shall be delivered to the jobsite wrapped in a protective covering. Cabinets shall be stored in accordance with manufacturer's recommendations in an adequately ventilated, dry location that is free of dust, water, or other contaminants and in a manner to permit access for inspection and handling. Cabinets shall be handled carefully to prevent damage to the surfaces. Damaged items that cannot be restored to like-new condition shall be replaced.

1.5 FIELD MEASUREMENTS

Field measurements prior to preparation of shop drawings and fabrication shall be taken to insure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.

1.6 QUALIFICATIONS OF INSTALLER

All installation work shall be accomplished by a casework/cabinet contractor who is regularly engaged in the installation of cabinets and who has been approved by the cabinet manufacturer to install their cabinets.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to reference documents listed and specified requirements.

2.1.1 High-Pressure Decorative Laminate (HPDL)

NEMA LD 3, satin finish, unless otherwise indicated.

2.1.1.1 Countertops

PF 42, satin finish.

2.1.1.2 Vertical Surfaces

GP 28 or PF 30, satin finish.

2.1.1.3 Backing Sheet

BK 20.

2.1.1.4 Cabinet Liner

CL 20.

2.1.2 Hardwood Plywood

ANSI/HPVA HP-1, Type II (Interior), three- or five-ply, with face veneer of good grade (1) or better. Species shall be White Oak for Enlisted Quarters and Maple for SOQs. Edge band exposed edges with minimum 1/8 inch thick, solid wood edging of same species as face veneer.

2.1.3 Softwood Plywood

PS-1.

2.1.3.1 Countertops

Exterior type, A/C Grade.

2.1.3.2 Elsewhere

Interior type, A-B Grade, may be used in lieu of hardwood plywood for concealed applications.

2.2 KITCHEN CABINETS AND VANITY CABINETS

2.2.1 Species of Wood

Species of wood shall be White Oak for all cabinets in Enlisted Quarters and Maple for all cabinets in General Officers' Quarters.

2.2.2 Style of Cabinets

All cabinets shall be reveal overlay and solid raised panel style. Flat or recessed panel styles are not acceptable.

2.2.3 Acceptable Manufacturers

Kitchen cabinets and vanity cabinets shall be one of the three manufacturers listed hereinafter or approved equal. All cabinets throughout all units shall be by the same manufacturer (a combination of cabinets by more than one manufacturer is not acceptable).

- a. Kraftmaid Cabinetry, style Piermont, DPC construction, Maple and Oak cabinets. Door style shall be Square Raised Panel.
- b. American Woodmark, Designer Series, door style Savannah for Oak cabinets and Kingsbury for Maple cabinets. Provide Option 05 (premium dovetail hardwood drawers).
- c. Brookhaven II Cabinetry, manufactured by Wood Mode, Inc. Door style shall be Andover Raised Square.

2.2.4 General Requirements

Shelves in wall cabinets shall be adjustable. Adjustable shelves shall be capable of adjusting on approximately 3 inch increments. Shelves shall be supported by self-locking clips or wood dowels. Dowels shall be approximately 5/16 inch in diameter by 1-9/16 inches long. Dowels shall be inserted into borings for the shelf adjustments.

2.2.5 Face Frame Type Cabinets

The cabinets shall be constructed with frame fronts and solid ends, or frame construction throughout. Frame members shall be 3/4 inch thick by 1-1/2 inch wide; kiln-dried hardwood of White Oak for Enlisted Quarters and Maple for SOQ's, glued together, and shall be either mortised and tenoned, dovetailed or doweled. Top and bottom corners shall be braced with either hardwood blocks that are glued together with water resistant glue and nailed in place, metal, or plastic corner braces. Bottoms of cabinets shall be braced with wood members glued in place.

2.2.6 Thickness and Size of Cabinet Components

The minimum thicknesses and sized (in inches) of cabinet components shall be as follows:

Frames	3/4 x 1-1/2 solid wood
Drawer Fronts	3/4 solid wood
Doors	3/4 solid wood stiles and rails and wood center panels as indicated
Sides	1/2 plywood
Tops	1/2 plywood
Bottoms	1/2 flake board
Backs	1/4 hardboard
Countertops	3/4 exterior grade plywood (2 layers)
Backsplashes	3/4 exterior grade plywood
Drawer Bottoms	1/4 hardboard
Drawer Sides	1/2 solid wood
Drawer Backs	1/2 solid wood
Drawer Subfronts	1/2 solid wood
Shelves	3/4 veneer with prefinished edge

2.2.7 Joinery

Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into side panels.

Provide polystyrene corner braces, stapled to the cabinet. Provide pilot holes to prevent splitting during countertop installation. Braces shall have a smooth flat surface to provide a secure level bond to countertop surfaces.

2.2.8 Drawers

Drawers for SOQ's shall be adjustable front drawers. Join subfronts, backs and sides with glued dovetail joints. Provide four mounting screws from interior of body for attaching drawer fronts to drawer subfronts to provide adjustable fronts. Provide epoxy coated metal and roller bearing self-closing undermounted drawer guides with positive stops to prevent spills and slide shut with just a slight touch. Provide two slides for each drawer.

Drawers for the Enlisted Quarters shall be unibody construction. Drawer back shall be set into sides. Drawer front shall be french dovetailed to drawer sides. Provide roller drawer slides. Provide two slides for each drawer.

2.2.9 Miscellaneous Components

2.2.9.1 Miscellaneous Components for Enlisted Quarters

Miscellaneous components shall be provided in connection with the kitchen and vanity cabinets in the Enlisted Quarters as indicated for a complete and finished installation, including the following:

- a. Pantry cabinets, White Oak.

2.2.9.2 Miscellaneous Components for SOQs

Miscellaneous components shall be provided in connection with the kitchen and vanity cabinets in the SOQs as indicated for a complete and finished installation, including the following:

- a. Traditional light valance at bottom of cabinets to conceal lights, Maple.
- b. Traditional crown moulding **at top of cabinets.**
- c. Glass in doors. Interior finish shall match exterior finish.
- d. Wine racks, Maple.
- e. Wood legs, size four inches by four inches on island counter as indicated, Maple.
- f. Pantry cabinet, Maple.
- g. File drawer, Maple.
- h. Trim moulding.

The species of wood and finish of the miscellaneous components listed above shall match the finish of the cabinets.

2.3 COUNTERTOPS AND BACKSPLASH

2.3.1 Vanity Countertops and Backsplash

Countertops and backsplash for vanities shall be solid polymer as specified in Section 06650 SOLID POLYMER (SOLID SURFACING) FABRICATIONS.

2.3.2 Kitchen Countertops and Backsplash

Countertop and backsplash shall be constructed of 3/4 inch thick exterior grade plywood. Provide post formed cove type for the Enlisted Quarters. Cove type shall be a single unit with self-edging and plastic laminate coved at the juncture of the countertop and backsplash. Edging and trim shall consist of plastic laminate cut and fitted to all exposed edges. End splashes constructed of 3/4 inch plywood. Provide a Maple countertop edge for the SOQs. The Maple edge shall have a OGEE profile along its top edge.

Backsplash shall be ceramic tile at countertops in SOQs. Continuous sheets of longest lengths practicable shall be provided. Joints in surface sheeting shall be tight and flush and held to a practicable minimum. When the countertop and backsplash are one unit, PF42 plastic laminate shall be used. Plastic laminate shall conform to the requirements of NEMA LD 3 and plastic laminate adhesive shall be contact type applied to both surfaces. For fully formed and cove type countertops, the post-forming plastic

laminate shall not be bent to a radius smaller than the limit recommended by the plastic manufacturer.

2.3.3 Sink Rims

Sink rims shall be of the corrosion resistant steel clamping type, sized to the sink, and a standard product of a manufacturer regularly producing this type of equipment.

2.4 FINISH

2.4.1 Cabinet Finish

Cabinets shall be provided with a factory-applied durable finish in accordance with KCMA ANSI/KCMA A161.1 requirements and of a type standard with the manufacturer. Stained wood doors, drawer fronts, cabinet fronts, and exposed frames and cabinet sides shall be fabricated of wood which will be free of extreme color variations within each panel or between adjacent panels. Exposed exterior surfaces shall be hardwood or grade A-A hardwood veneer with natural stain and sprayed on polyurethane factory applied finish. Color of stain shall be as selected by Contracting Officer. The Maple edge on the countertops in the SOQs shall receive two additional coats of polyurethane.

2.4.2 Melamine Laminates on Countertops

Continuous sheets of longest lengths practicable shall be provided. Joints in surface sheeting shall be tight and flush and held to a practicable minimum. When the countertop and backsplash are one unit, PF42 plastic laminate shall be used. Plastic laminate shall conform to the requirements of NEMA LD 3 and plastic laminate adhesive shall be contact type applied to both surfaces. For fully formed and cove type countertops (for the Enlisted Quarters), the post-forming plastic laminate shall not be bent to a radius smaller than the limit recommended by the plastic manufacturer.

2.4.3 Backer Sheets

Backer Sheets of high pressure plastic laminate, shall conform to NEMA LD 3, Grade BK20 and shall be applied to the underside of all core material.

2.5 HARDWARE

Hardware shall conform to BHMA ANSI/BHMA A156.9, shall be suitable for kitchen cabinet use, and shall include all miscellaneous hardware for a complete installation. Door hinges shall be self-closing type. Drawer runners shall have nylon rollers standard with the manufacturer.

2.5.1 Enlisted Quarters for Kitchen Cabinets and Vanity Cabinets

- a. Drawer Pulls - burnished brass finish.
- b. Door Knobs - burnished brass finish.
- c. Full Surface Hinges - BHMA ANSI/BHMA A156.9 number B01131.
- d. Side Mounted Drawer Slides - BHMA ANSI/BHMA A156.9 number B05051.
- e. Magnetic Catches - BHMA ANSI/BHMA A156.9 number B03141 or B03151,

as appropriate for the condition.

2.5.2 SOQs for Kitchen Cabinets and Vanity Cabinets

- a. Drawer Pulls - Satin antique brass finish, Liberty No. PN0601-BZA (2-1/2 inch cup pulls) or approved equal.
- b. Door Knobs (Kitchen) - Satin antique brass finish, Liberty No. P50156V-SBA or approved equal.
- c. Concealed Hinges - BHMA ANSI/BHMA A156.9 number B01602; hinges shall permit 110 degrees swing.
- d. Side Mounted Drawer Slides - BHMA ANSI/BHMA A156.9 number B05051.
- e. Door Knobs (Vanity) - Satin nickel finish, Liberty No. P50156V-SN or approved equal.
- f. Magnetic Catches - BHMA ANSI/BHMA A156.9 number B03141 or B03151, as appropriate for the condition.

2.6 COLOR, TEXTURE, AND PATTERN

Design, color, and finish shall be as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Cabinets shall be installed level, plumb, and true to line, and shall be attached to the walls or floors with suitable devices to securely anchor each unit. Countertops, accessories, and hardware shall be installed as indicated. Installation shall be in accordance with the manufacturer's approved printed instructions. The inner edge of sink cut-outs in laminated plastic tops shall be painted with a coat of semigloss enamel paint and sink flanges shall be set in a bed of sealant. Closer and filler strips and finish moldings shall be provided as required. Prior to final acceptance, doors shall be aligned, and hardware shall be adjusted.

3.2 CLEANING

Cabinet and countertop surfaces shall be cleaned in accordance with manufacturer's instructions.

-- End of Section --

SECTION 12490A

WINDOW TREATMENT
01/98

PART 1 WORK DESCRIPTION

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS AA-V-00200

(Rev B) Venetian Blinds

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Window Treatments
Hardware

Manufacturer's data composed of catalog cuts, brochures, product information, and maintenance instructions.

SD-04 Samples

Window Treatments; G

Three samples of each type and color of window treatment. Blind slats or louvers shall be 6 inches in length for each color. Track shall be 6 inches in length. Shade material shall be minimum 6 x 6 inches in size.

1.3 GENERAL

Window treatment shall be provided, complete with necessary brackets, fittings, and hardware. Each window treatment type shall be a complete unit provided in accordance with paragraph WINDOW TREATMENT PLACEMENT SCHEDULE. Equipment shall be mounted and operated as indicated. Windows to receive a treatment shall be completely covered. The Contractor shall take measurements at the building and shall be responsible for the proper fitting and hanging of the equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

Components shall be delivered to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Components shall be stored in a dry location

that is adequately ventilated and free from dust, water, or other contaminants and shall have easy access for inspection and handling. Materials shall be stored flat in a clean dry area with temperature maintained above 50 degrees F.

1.5 FIELD MEASUREMENTS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 PRODUCTS

2.1 WINDOW BLINDS

Each blind, including hardware, accessory items, mounting brackets and fastenings, shall be provided as a complete unit produced by one manufacturer. All parts shall be one color unless otherwise shown, and match the color of the blind slat. Steel features shall be treated for corrosion resistance.

2.1.1 Horizontal Blinds

Horizontal blinds shall conform to FS AA-V-00200, Type II (1 inch slats), except as modified below. Blind units shall be capable of nominally 180 degree partial tilting operation and full-height raising. Blinds shall be inside mount as shown. Tapes for slats shall be longitudinal reinforced vinyl plastic in 1-piece turn ladder construction.

2.1.1.1 Head Channel and Slats

Head channel shall be steel or aluminum nominal 0.018 in. for Type I. Slats shall be aluminum, not less than 0.008 inch thick, and of sufficient strength to prevent sag or bow in the finished blind. A sufficient amount of slats shall be provided to assure proper control, uniform spacing, and adequate overlap.

2.1.1.2 Controls

The slats shall be tilted by a transparent tilting wand, hung vertically by its own weight, and shall swivel for easy operation. The tilter control shall be of enclosed construction. Moving parts and mechanical drive shall be made of compatible materials which do not require lubrication during normal expected life. The tilter shall tilt the slats to any desired angle and hold them at that angle so that any vibration or movement of ladders and slats will not drive the tilter and change the angle of slats. A mechanism shall be included to prevent over tightening. The wand shall be of sufficient length to reach to within 5 feet of the floor.

2.1.1.3 Intermediate Brackets

Intermediate brackets shall be provided for installation of blinds over 48 inches wide and shall be installed as recommended by the manufacturer.

2.2 COLOR

Color shall be as indicated in color schedule.

PART 3 EXECUTION

3.1 WINDOW TREATMENT PLACEMENT SCHEDULE

Window covering shall be provided as follows: At all windows and glazed exterior door openings.

3.2 INSTALLATION

Installation shall be in accordance with the approved detail drawings and manufacturer's installation instructions. Units shall be level, plumb, secure, and at proper height and location relative to window units. The Contractor shall furnish and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Installation shall not be initiated until completion of room painting and finishing operations. Upon completion of the installation, window treatments shall be adjusted for form and appearance, shall be in proper operating condition, and shall be free from damage or blemishes. Damaged units shall be repaired or replaced by the Contractor as directed by the Contracting Officer.

-- End of Section --

SECTION 13280A

ASBESTOS ABATEMENT

11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- | | |
|------------|---|
| ANSI Z87.1 | (1989; Errata; Z87.1a) Occupational and Educational Eye and Face Protection |
| ANSI Z88.2 | (1992) Respiratory Protection |
| ANSI Z9.2 | (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------|--|
| ASTM C 732 | (1995) Aging Effects of Artificial Weathering on Latex Sealants |
| ASTM D 1331 | (1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents |
| ASTM D 4397 | (1996) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications |
| ASTM E 119 | (2000) Fire Tests of Building Construction and Materials |
| ASTM E 1368 | (2000) Visual Inspection of Asbestos Abatement Projects |
| ASTM E 736 | (1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members |
| ASTM E 84 | (2000a) Surface Burning Characteristics of Building Materials |
| ASTM E 96 | (2000) Water Vapor Transmission of Materials |

COMPRESSED GAS ASSOCIATION (CGA)

- | | |
|-----------|---|
| CGA G-7 | (1990) Compressed Air for Human Respiration |
| CGA G-7.1 | (1997) Commodity Specification for Air |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (1999) Methods of Fire Tests for
Flame-Resistant Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 84-100 (1984; Supple 1985, 1987, 1988 & 1990)
NIOSH Manual of Analytical Methods

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety
and Health Requirements Manual

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90/018 (1990) Asbestos/NESHAP Regulated Asbestos
Containing Materials Guidance

EPA 340/1-90/019 (1990) Asbestos/NESHAP Adequately Wet
Guidance

EPA 560/5-85-024 (1985) Guidance for Controlling
Asbestos-Containing Materials in Buildings

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for
Construction

40 CFR 61 National Emission Standards for Hazardous
Air Pollutants

40 CFR 763 Asbestos

42 CFR 84 Approval of Respiratory Protective Devices

49 CFR 107 Hazardous Materials Program Procedures

49 CFR 171 General Information, Regulations, and
Definitions

49 CFR 172 Hazardous Materials Table, Special
Provisions, Hazardous Materials
Communications, Emergency Response
Information, and Training Requirements

49 CFR 173 Shippers - General Requirements for
Shipments and Packagings

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency,
Particulate, Air Filter Units

1.2 DEFINITIONS

- a. Adequately Wet: A term defined in 40 CFR 61, Subpart M, and EPA 340/1-90/019 meaning to sufficiently mix or penetrate with liquid to prevent the release of particulate. If visible emissions are observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wetted.
- b. Aggressive Method: Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact asbestos-containing material (ACM).
- c. Amended Water: Water containing a wetting agent or surfactant with a surface tension of at least 29 dynes per square centimeter when tested in accordance with ASTM D 1331.
- d. Asbestos: Asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.
- e. Asbestos-Containing Material (ACM): Any materials containing more than one percent asbestos.
- f. Asbestos Fiber: A particulate form of asbestos, 5 micrometers or longer, with a length-to-width ratio of at least 3 to 1.
- g. Authorized Person: Any person authorized by the Contractor and required by work duties to be present in the regulated areas.
- h. Building Inspector: Individual who inspects buildings for asbestos and has EPA Model Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- i. Certified Industrial Hygienist (CIH): An Industrial Hygienist certified in the practice of industrial hygiene by the American Board of Industrial Hygiene.
- j. Class I Asbestos Work: Activities defined by OSHA involving the removal of thermal system insulation (TSI) and surfacing ACM.
- k. Class II Asbestos Work: Activities defined by OSHA involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos - containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and cements when they are still intact are excluded from Class II asbestos work.
- n. Clean room: An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

- o. Competent Person: In addition to the definition in 29 CFR 1926, Section .32(f), a person who is capable of identifying existing asbestos hazards as defined in 29 CFR 1926, Section .1101, selecting the appropriate control strategy, has the authority to take prompt corrective measures to eliminate them and has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- p. Contractor/Supervisor: Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- q. Critical Barrier: One or more layers of plastic sealed over all openings into a regulated area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a regulated area from migrating to an adjacent area.
- r. Decontamination Area: An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.
- s. Demolition: The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.
- t. Disposal Bag: A 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926, Section .1101, used for transporting asbestos waste from containment to disposal site.
- u. Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in 1 standard sized glovebag or waste bag, not larger than 60 inches in length and width in order to access a building component.
- v. Equipment Room or Area: An area adjacent to the regulated area used for the decontamination of employees and their equipment.
- w. Employee Exposure: That exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.
- x. Fiber: A fibrous particulate, 5 micrometers or longer, with a length to width ratio of at least 3 to 1.
- y. Friable ACM: A term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent, as determined by a method other than point counting by PLM, the asbestos content is verified by point counting using PLM.

- z. Glovebag: Not more than a 60 by 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.
- aa. High-Efficiency Particulate Air (HEPA) Filter: A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.
- bb. Homogeneous Area: An area of surfacing material or thermal system insulation that is uniform in color and texture.
- cc. Industrial Hygienist: A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards.
- dd. Intact: ACM which has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix. Removal of "intact" asphaltic, resinous, cementitious products does not render the ACM non-intact simply by being separated into smaller pieces.
- ee. Model Accreditation Plan (MAP): USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763, Subpart E, Appendix C.
- ff. Modification: A changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system.
- gg. Negative Exposure Assessment: A demonstration by the Contractor to show that employee exposure during an operation is expected to be consistently below the OSHA Permissible Exposure Limits (PELs).
- hh. NESHAP: National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61, Subpart M.
- ii. Nonfriable ACM: A NESHAP term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material containing more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.
- 11. Permissible Exposure Limits (PELs):
 - (1) PEL-Time weighted average(TWA): Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8 hour time weighted average (TWA), as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.
 - (2) PEL-Excursion Limit: An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes as determined by the method prescribed in 29 CFR 1926,

Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.

- mm. Regulated Area: An OSHA term defined in 29 CFR 1926, Section .1101 meaning an area established by the Contractor to demarcate areas where Class I, II, and III asbestos work is conducted; also any adjoining area where debris and waste from such asbestos work accumulate; and an area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.
- nn. Removal: All operations where ACM is taken out or stripped from structures or substrates, and includes demolition operations.
- pp. Spills/Emergency Cleanups: Cleanup of sizable amounts of asbestos waste and debris which has occurred, for example, when water damage occurs in a building, and sizable amounts of ACM are dislodged. A Competent Person evaluates the site and ACM to be handled, and based on the type, condition and extent of the dislodged material, classifies the cleanup as Class I, II, or III. Only if the material was intact and the cleanup involves mere contact of ACM, rather than disturbance, could there be a Class IV classification.
- rr. Thermal system insulation (TSI) ACM: ACM which contains more than 1% asbestos and is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation.
- tt. Worker: Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926, Section .1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, if required by the OSHA Class of work to be performed or by the state where the work is to be performed.

1.3 DESCRIPTION OF WORK

The work covered by this section includes the removal of asbestos-containing window caulk, step tread, duct vibration cloth, and thermal system insulation which are encountered during renovation activities associated with Historic Family Housing Phase 3 located at Langley Air Force Base, Virginia. This section describes procedures and equipment required to protect workers of the regulated area from contact with airborne asbestos fibers and ACM dust and debris. Activities include OSHA Class I Class II work operations involving ACM. The work also includes containment, storage, transportation and disposal of the generated ACM wastes. More specific operational procedures shall be detailed in the required Accident Prevention Plan and its subcomponents, the Asbestos Hazard Abatement Plan and Activity Hazard Analyses required in paragraph SAFETY AND HEALTH PROGRAM AND PLANS.

1.3.1 Abatement Work Tasks

The specific ACM to be abated is identified on the demolition drawings.

1.3.2 Unexpected Discovery of Asbestos

For any previously untested building components suspected to contain asbestos and located in areas impacted by the work, the Contractor shall notify the Contracting Officer (CO) who will have the option of ordering up to ten bulk samples to be obtained at the Contractor's expense and delivered to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)" and analyzed by PLM at no additional cost to the Government. Any additional components identified as ACM that have been approved by the Contracting Officer for removal shall be removed by the Contractor and will be paid for by an equitable adjustment to the contract price under the CONTRACT CLAUSE titled "changes". Sampling activities undertaken to determine the presence of additional ACM shall be conducted by personnel who have successfully completed the EPA Model Accreditation Plan (MAP) "Building Inspector" training course required by 40 CFR 763, Subpart E, Appendix C.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Respiratory Protection Program; G,

Records of the respirator program.

Cleanup and Disposal; G,

Waste shipment records. Weigh bills and delivery tickets shall be furnished for information only.

Materials and Equipment

Manufacturer's catalog data for all materials and equipment to be used in the work, including brand name, model, capacity, performance characteristics and any other pertinent information. Material Safety Data Sheets for all chemicals to be used onsite in the same format as implemented in the Contractor's HAZARD COMMUNICATION PROGRAM. Data shall include, but shall not be limited to, the following items:

- a. High Efficiency Filtered Air (HEPA) local exhaust equipment
- b. Vacuum cleaning equipment
- c. Pressure differential monitor for HEPA local exhaust equipment
- d. Air monitoring equipment
- e. Respirators

- f. Personal protective clothing and equipment
- g. Glovebag
- h. Duct Tape
- i. Disposal Containers
 - (1) Disposal bags
- j. Sheet Plastic
 - (1) Polyethylene Sheet - General
- k. Wetting Agent
 - (1) Amended Water
 - (2) Removal encapsulant
- l. Strippable Coating
- m. Prefabricated Decontamination Unit
- n. Other items
- o. Chemical encapsulant
- q. Material Safety Data Sheets (for all chemicals proposed)

Qualifications; G,

A written report providing evidence of qualifications for personnel, facilities and equipment assigned to the work.

Training Program; ,

A copy of the written project site-specific training material as indicated in 29 CFR 1926, Section.1101 that will be used to train onsite employees. The training document shall be signed by the Contractor's Designated IH and Competent Person.

Medical Requirements; ,

Physician's written opinion.

Encapsulants; G,

Certificates stating that encapsulants meet the applicable specified performance requirements.

SD-06 Test Reports

Exposure Assessment and Air Monitoring; G,

Initial exposure assessments, negative exposure assessments,
air-monitoring results and documentation.

Local Exhaust Ventilation

Pressure differential recordings.

Licenses, Permits and Notifications

Licenses, permits, and notifications.

SD-07 Certificates

Vacuum, Filtration and Ventilation Equipment

Manufacturer's certifications showing compliance with ANSI Z9.2
for:

- a. Vacuums.
- b. Water filtration equipment.
- c. Ventilation equipment.
- d. Other equipment required to contain airborne asbestos fibers.

1.5 QUALIFICATIONS

1.5.1 Written Qualifications and Organization Report

The Contractor shall furnish a written qualifications and organization report providing evidence of qualifications of the Contractor, Contractor's Project Supervisor, Designated Competent Person, supervisors and workers; Designated IH (person assigned to project and firm name); independent testing laboratory (including name of firm, principal, and analysts who will perform analyses); all subcontractors to be used including disposal transportation and disposal facility firms, subcontractor supervisors, subcontractor workers; and any others assigned to perform asbestos abatement and support activities. The report shall include an organization chart showing the Contractor's staff organization for this project by name and title, chain of command and reporting relationship with all subcontractors. The report shall be signed by the Contractor, the Contractor's onsite project manager, Designated Competent Person, Designated IH, designated testing laboratory and the principals of all subcontractors to be used. The Contractor shall include the following statement in the report: "By signing this report I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and the federal, state and local requirements specified in paragraph SAFETY AND HEALTH PROGRAM AND PLANS for those asbestos abatement activities that they will be involved in."

1.5.2 Specific Requirements

The Contractor shall designate in writing, personnel meeting the following qualifications:

- a. Designated Competent Person: The name, address, telephone number, and resume of the Contractor's Designated Competent Person shall be provided. Evidence that the full-time Designated Competent Person is qualified in accordance with 29 CFR 1926, Sections .32 and .1101, has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and is experienced in the administration and supervision of asbestos abatement projects, including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. The duties of the Competent Person shall include the following: controlling entry to and exit from the regulated area; supervising any employee exposure monitoring required by 29 CFR 1926, Section .1101; ensuring that all employees working within a regulated area wear the appropriate personal protective equipment (PPE), are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating conditions and are functioning properly. The Designated Competent Person shall be responsible for compliance with applicable federal, state and local requirements, the Contractor's Accident Prevention Plan and Asbestos Hazard Abatement Plan. The Designated Competent Person shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that this person has a minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA competent person requirements. The Designated Competent Person shall be onsite at all times during the conduct of this project.
- b. Project and Other Supervisors: The Contractor shall provide the name, address, telephone number, and resume of the Project Supervisor and other supervisors who have responsibility to implement the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses, the authority to direct work performed under this contract and verify compliance, and have EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C. The Project Supervisor and other supervisors shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that the Project Supervisor has a minimum of 2 years of on-the-job asbestos abatement experience relevant to project supervisor responsibilities and the other supervisors have a minimum of 1 year on-the-job asbestos abatement experience commensurate with the responsibilities they will have on this project.
- c. Designated Industrial Hygienist: The Contractor shall provide the name, address, telephone number, resume and other information

specified below for the Industrial Hygienist (IH) selected to prepare the Contractor's Asbestos Hazard Abatement Plan, prepare and perform training, direct air monitoring and assist the Contractor's Competent Person in implementing and ensuring that safety and health requirements are complied with during the performance of all required work. The Designated IH shall be a person who is board certified in the practice of industrial hygiene as determined and documented by the American Board of Industrial Hygiene (ABIH), has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and has a minimum of 2 years of comprehensive experience in planning and overseeing asbestos abatement activities. The Designated IH shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Designated IH shall be completely independent from the Contractor according to federal, state, or local regulations; that is, shall not be a Contractor's employee or be an employee or principal of a firm in a business relationship with the Contractor negating such independent status. A copy of the Designated IH's current valid ABIH certification shall be included. The Designated IH shall visit the site at least twice per month for the duration of asbestos activities and shall be available for emergencies. In addition, the Designated IH shall prepare, and the Contractor shall submit, the name, address, telephone numbers and resumes of additional IH's and industrial hygiene technicians (IHT) who will be assisting the Designated IH in performing onsite tasks. IHs and IHTs supporting the Designated IH shall have a minimum of 2 years of practical onsite asbestos abatement experience. The formal reporting relationship between the Designated IH and the support IHs and IHTs, the Designated Competent Person, and the Contractor shall be indicated.

- d. Asbestos Abatement Workers: Asbestos abatement workers shall meet the requirements contained in 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and other applicable federal, state and local requirements. Worker training documentation shall be provided as required on the "Certificate of Workers Acknowledgment" in this paragraph.
- e. Worker Training and Certification of Worker Acknowledgment: Training documentation will be required for each employee who will perform OSHA Class I and Class II asbestos abatement operations. Such documentation shall be submitted on a Contractor generated form titled "Certificate of Workers Acknowledgment", to be completed for each employee in the same format and containing the same information as the example certificate at the end of this section. Training course completion certificates (initial and most recent update refresher) required by the information checked on the form shall be attached.
- f. Physician: The Contractor shall provide the name, medical qualifications, address, telephone number and resume of the physician who will or has performed the medical examinations and evaluations of the persons who will conduct the asbestos abatement work tasks. The physician shall be currently licensed by the state where the workers will be or have been examined, have expertise in

pneumoconiosis and shall be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1926, Section .1101 and paragraph MEDICAL REQUIREMENTS. The physician shall be familiar with the site's hazards and the scope of this project.

- g. First Aid and CPR Trained Persons: The names of at least 2 persons who are currently trained in first aid and CPR by the American Red Cross or other approved agency shall be designated and shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030 and shall be included in the Contractor's Bloodborne Pathogen Program. These persons may perform other duties but shall be immediately available to render first aid when needed. A copy of each designated person's current valid First Aid and CPR certificate shall be provided.
- h. Independent Testing Laboratory: The Contractor shall provide the name, address and telephone number of the independent testing laboratory selected to perform the sample analyses and report the results. The testing laboratory shall be completely independent from the Contractor as recognized by federal, state or local regulations. Written verification of the following criteria, signed by the testing laboratory principal and the Contractor, shall be submitted:
 - (1) Phase contrast microscopy (PCM): The laboratory is fully equipped and proficient in conducting PCM of airborne samples using the methods specified by 29 CFR 1926, Section .1101, OSHA method ID-160, the most current version of NIOSH Pub No. 84-100 Method 7400. The laboratory is currently judged proficient (classified as acceptable) in counting airborne asbestos samples by PCM by successful participation in each of the last 4 rounds in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program; the names of the selected microscopists who will analyze airborne samples by PCM with verified documentation of their proficiency to conduct PCM analyses by being judged proficient in counting samples as current participating analysts in the AIHA PAT Program, and having successfully completed the Asbestos Sampling and Analysis course (NIOSH 582 or equivalent) with a copy of course completion certificate provided; when the PCM analysis is to be conducted onsite, documentation shall be provided certifying that the onsite analyst meets the same requirements.
 - (2) Polarized light microscopy (PLM): The laboratory is fully equipped and proficient in conducting PLM analyses of suspect ACM bulk samples in accordance with 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for bulk asbestos analysis and will use analysts (names shall be provided) with demonstrated proficiency to conduct PLM to include its application to the identification and quantification of asbestos content.
 - (4) PCM/TEM: The laboratory is fully equipped and each analyst (name shall be provided) possesses demonstrated proficiency in

conducting PCM and TEM analysis of airborne samples using NIOSH Pub No. 84-100 Method 7400 PCM and NIOSH Pub No. 84-100 Method 7402 (TEM confirmation of asbestos content of PCM results) from the same filter.

- i. Disposal Facility, Transporter: The Contractor shall provide written evidence that the landfill to be used is approved for asbestos disposal by the USEPA and state and local regulatory agencies. Copies of signed agreements between the Contractor (including subcontractors and transporters) and the asbestos waste disposal facility to accept and dispose of all asbestos containing waste generated during the performance of this contract shall be provided. Qualifications shall be provided for each subcontractor or transporter to be used, indicating previous experience in transport and disposal of asbestos waste to include all required state and local waste hauler requirements for asbestos. The Contractor and transporters shall meet the DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and other applicable state or local requirements. The disposal facility shall meet the requirements of 40 CFR 61, Sections .154 or .155, as required in 40 CFR 61, Section .150(b), and other applicable state or local requirements.

1.5.3 Federal, State or Local Citations on Previous Projects

The Contractor and all subcontractors shall submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company shall be provided.

1.6 REGULATORY REQUIREMENTS

In addition to detailed requirements of this specification, work performed under this contract shall comply with EM 385-1-1, applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. This includes, but is not limited to, OSHA standards, 29 CFR 1926, especially Section .1101, 40 CFR 61, Subpart M and 40 CFR 763. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.7 SAFETY AND HEALTH PROGRAM AND PLANS

The Contractor shall develop and submit a written comprehensive site-specific Accident Prevention Plan at least 30 days prior to the preconstruction conference. The Accident Prevention Plan shall address requirements of EM 385-1-1, Appendix A, covering onsite work to be performed by the Contractor and subcontractors. The Accident Prevention Plan shall incorporate an Asbestos Hazard Abatement Plan, and Activity Hazard Analyses as separate appendices into 1 site specific Accident

Prevention Plan document. Any portions of the Contractor's overall Safety and Health Program that are referenced in the Accident Prevention Plan, e.g., respirator program, hazard communication program, confined space entry program, etc., shall be included as appendices to the Accident Prevention Plan. The plan shall take into consideration all the individual asbestos abatement work tasks identified in Table 1. The plan shall be prepared, signed (and sealed, including certification number if required), and dated by the Contractor's Designated IH, Competent Person, and Project Supervisor.

1.7.1 Asbestos Hazard Abatement Plan Appendix

The Asbestos Hazard Abatement Plan appendix to the Accident Prevention Plan shall include, but not be limited to, the following:

- a. The personal protective equipment to be used;
- b. The location and description of regulated areas including clean and dirty areas, and decontamination unit (clean room, shower room, equipment room, storage areas;
- c. Initial exposure assessment in accordance with 29 CFR 1926, Section .1101;
- d. Level of supervision;
- e. Method of notification of other employers at the worksite;
- f. Abatement method to include containment and control procedures;
- g. Interface of trades involved in the construction;
- h. Sequencing of asbestos related work;
- i. Storage and disposal procedures and plan;
- j. Type of wetting agent to be used;
- k. Location of local exhaust equipment;
- l. Air monitoring methods (personal, environmental and clearance);
- m. Bulk sampling and analytical methods (if required);
- n. A detailed description of the method to be employed in order to control the spread of ACM wastes and airborne fiber concentrations;
- o. Fire and medical emergency response procedures;
- p. The security procedures to be used for all regulated areas.

1.7.2 Activity Hazard Analyses Appendix

Activity Hazard Analyses, for each major phase of work, shall be submitted and updated during the project. The Activity Hazard Analyses format shall be in accordance with EM 385-1-1 (Figure 1-1). The analysis shall define the activities to be performed for a major phase of work, identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the Activity

Hazard Analyses has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the onsite Government representatives. The Activity Hazard Analyses shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations.

1.8 PRECONSTRUCTION CONFERENCE AND ONSITE SAFETY

The Contractor and the Contractor's Designated Competent Person, Project Supervisor, and Designated IH shall meet with the Contracting Officer prior to beginning work at a safety preconstruction conference to discuss the details of the Contractor's submitted Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses appendices. Deficiencies in the Accident Prevention Plan will be discussed and the Accident Prevention Plan shall be revised to correct the deficiencies and resubmitted for acceptance. Any changes required in the specification as a result of the Accident Prevention Plan shall be identified specifically in the plan to allow for free discussion and acceptance by the Contracting Officer, prior to the start of work. Onsite work shall not begin until the Accident Prevention Plan has been accepted. A copy of the written Accident Prevention Plan shall be maintained onsite. Changes and modifications to the accepted Accident Prevention Plan shall be made with the knowledge and concurrence of the Designated IH, the Project Supervisor, Designated Competent Person, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Designated IH shall bring such hazard to the attention of the Project Supervisor, Designated Competent Person, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Once accepted by the Contracting Officer, the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses will be enforced as if an addition to the contract. Disregarding the provisions of this contract or the accepted Accident Prevention Plan will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. .

1.9 SECURITY

Locked security area shall be provided for each regulated area. A log book shall be kept documenting entry into and out of the regulated area. Entry into regulated areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas shall be trained, be medically evaluated, and wear the required personal protective equipment for the specific regulated area to be entered.

1.10 MEDICAL REQUIREMENTS

Medical requirements shall conform to 29 CFR 1926, Section .1101.

1.10.1 Medical Examinations

Before being exposed to airborne asbestos fibers, workers shall be provided with a medical examination as required by 29 CFR 1926, Section .1101 and other pertinent state or local requirements. This requirement shall have been satisfied within the last 12 months. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the

termination of employment in such occupation. X-ray films of asbestos workers shall be identified to the consulting radiologist and medical record jackets shall be marked with the word "asbestos."

1.10.1.1 Information Provided to the Physician

The Contractor shall provide the following information in writing to the examining physician:

- a. A copy of 29 CFR 1926, Section .1101 and Appendices D, E, G, and I;
- b. A description of the affected employee's duties as they relate to the employee's exposure;
- c. The employee's representative exposure level or anticipated exposure level;
- d. A description of any personal protective and respiratory equipment used or to be used;
- e. Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

1.10.1.2 Written Medical Opinion

For each worker, a written medical opinion prepared and signed by a licensed physician indicating the following:

- a. Summary of the results of the examination.
- b. The potential for an existing physiological condition that would place the employee at an increased risk of health impairment from exposure to asbestos.
- c. The ability of the individual to wear personal protective equipment, including respirators, while performing strenuous work tasks under cold and/or heat stress conditions.
- d. A statement that the employee has been informed of the results of the examination, provided with a copy of the results, informed of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure, and informed of any medical condition that may result from asbestos exposure.

1.10.2 Medical and Exposure Records

Complete and accurate records shall be maintained of each employee's medical examinations, medical records, and exposure data, as required by 29 CFR 1910, Section .1910.20 and 29 CFR 1926, Section .1101 for an indefinite period of years after termination of employment. Records of the required medical examinations and exposure data shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health (OSHA) or authorized representatives of the employee and an employee's physician upon request of the employee or former employee. A copy of the required medical certification for each employee shall be maintained on file at the worksite for review, as requested by the Contracting Officer or the representatives.

1.11 TRAINING PROGRAM

1.11.1 General Training Requirements

The Contractor shall establish a training program as specified by EPA Model Accreditation Plan (MAP), training requirements at 40 CFR 763, Subpart E, Appendix C, the Commonwealth of Virginia, OSHA requirements at 29 CFR 1926, Section .1101(k)(9), and this specification. Contractor employees shall complete the required training for the type of work they are to perform and such training shall be documented and provided to the Contracting Officer as specified in paragraph QUALIFICATIONS.

1.11.2 Project Specific Training

Prior to commencement of work, each worker shall be instructed by the Contractor's Designated IH and Competent Person in the following project specific training:

- a. The hazards and health effects of the specific types of ACM to be abated;
- b. The content and requirements of the Contractor's Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses and site-specific safety and health precautions;
- c. Hazard Communication Program;
- d. Hands-on training for each asbestos abatement technique to be employed;
- e. Heat and/or cold stress monitoring specific to this project;
- f. Air monitoring program and procedures;
- g. Medical surveillance to include medical and exposure record-keeping procedures;
- h. The association of cigarette smoke and asbestos-related disease;
- i. Security procedures;
- j. Specific work practice controls and engineering controls required for each Class of work in accordance with 29 CFR 1926, Section .1101.

1.12 RESPIRATORY PROTECTION PROGRAM

The Contractor's Designated IH shall establish in writing, and implement a respiratory protection program in accordance with 29 CFR 1926, Section .1101, 29 CFR 1910, Section .134, ANSI Z88.2, CGA G-7, CGA G-7.1. The Contractor's Designated IH shall establish minimum respiratory protection requirements based on measured or anticipated levels of airborne asbestos fiber concentrations encountered during the performance of the asbestos abatement work. The Contractor's respiratory protection program shall include, but not be limited to, the following elements:

- a. The company policy, used for the assignment of individual responsibility, accountability, and implementation of the respiratory protection program.

- b. The standard operating procedures covering the selection and use of respirators. Respiratory selection shall be determined by the hazard to which the worker is exposed.
- c. Medical evaluation of each user to verify that the worker may be assigned to an activity where respiratory protection is required.
- d. Training in the proper use and limitations of respirators.
- e. Respirator fit-testing, i.e., quantitative, qualitative and individual functional fit checks.
- f. Regular cleaning and disinfection of respirators.
- g. Routine inspection of respirators during cleaning and after each use when designated for emergency use.
- h. Storage of respirators in convenient, clean, and sanitary locations.
- i. Surveillance of regulated area conditions and degree of employee exposure (e.g., through air monitoring).
- j. Regular evaluation of the continued effectiveness of the respiratory protection program.
- k. Recognition and procedures for the resolution of special problems as they affect respirator use (e.g., no facial hair that comes between the respirator face piece and face or interferes with valve function; prescription eye wear usage; contact lenses usage; etc.).
- l. Proper training in putting on and removing respirators.

1.12.1 Respiratory Fit Testing

A qualitative or quantitative fit test conforming to 29 CFR 1926, Section 1101, Appendix C shall be conducted by the Contractor's Designated IH for each Contractor worker required to wear a respirator, and for the Contracting Officer and authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test shall be performed for each worker wearing a negative-pressure respirator prior to initially wearing a respirator on this project and every 6 months thereafter. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, or of full-facepiece air purifying respirators where they are worn at levels at which half-facepiece air purifying respirators are permitted. If physical changes develop that will affect the fit, a new fit test for the worker shall be performed. Functional fit checks shall be performed by employees each time a respirator is put on and in accordance with the manufacturer's recommendation.

1.12.2 Respirator Selection and Use Requirements

The Contractor shall provide respirators, and ensure that they are used as required by 29 CFR 1926, Section .1101 and in accordance with the manufacturer's recommendations. Respirators shall be jointly approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (MSHA/NIOSH), or by NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. Personnel who handle ACM, enter regulated areas that

require the wearing of a respirator, or who are otherwise carrying out abatement activities that require the wearing of a respirator, shall be provided with approved respirators that are fully protective of the worker at the measured or anticipated airborne asbestos concentration level to be encountered. For air-purifying respirators, the particulate filter portion of the cartridges or canister approved for use in airborne asbestos environments shall be high-efficiency particulate air (HEPA). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type shall be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered. Recommendations made by the Contractor's Designated IH to downgrade respirator type shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person in consultation with the Designated IH, shall have the authority to take immediate action to upgrade or downgrade respiratory type when there is an immediate danger to the health and safety of the wearer. Respirators shall be used in the following circumstances:

- a. During all Class I asbestos jobs.
- b. During all Class II work where the ACM is not removed in a substantially intact state.
- c. During all Class II work which is not performed using wet methods. Respirators need not be worn during removal of ACM from sloped roofs when a negative exposure assessment has been made and ACM is removed in an intact state.
- d. During all Class II asbestos jobs where the Contractor does not produce a negative exposure assessment.
- g. During all work where employees are exposed above the PEL-TWA or PEL-Excursion Limit.
- h. In emergencies

1.12.3 Class I Work

The Contractor shall provide: (1) a tight-fitting, powered air purifying respirator equipped with high efficiency filters, or (2) a full-facepiece supplied air respirator operated in the pressure demand mode, equipped with HEPA egress cartridges, or (3) an auxiliary positive pressure self-contained breathing apparatus, for all employees within the regulated area where Class I work is being performed; provided that a negative exposure assessment has not been produced, and that the exposure level will not exceed 1 f/cc as an 8-hour time weighted average. A full-facepiece supplied air respirator, operated in the pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions, if the exposure assessment indicates exposure levels above 1 f/cc as an 8-hour time weighted average.

1.12.4 Class II Work

The Contractor shall provide an air purifying respirator, other than a disposable respirator, equipped with high-efficiency filters whenever the

employee performs Class II asbestos jobs where the Contractor does not produce a negative exposure assessment.

1.12.5 Sanitation

Employees who wear respirators shall be permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

1.13 HAZARD COMMUNICATION PROGRAM

A hazard communication program shall be established and implemented in accordance with 29 CFR 1926, Section .59. Material safety data sheets (MSDSs) shall be provided for all hazardous materials brought onto the worksite. One copy shall be provided to the Contracting Officer and 1 copy shall be included in the Contractor's Hazard Communication Program.

1.14 LICENSES, PERMITS AND NOTIFICATIONS

1.14.1 General Legal Requirements

Necessary licenses, permits and notifications shall be obtained in conjunction with the project's asbestos abatement, transportation and disposal actions and timely notification furnished of such actions as required by federal, state, regional, and local authorities. The Contractor shall notify the Regional Office of the USEPA state's environmental protection agency responsible for asbestos air emissions local air pollution control district/agency state OSHA program and the Contracting Officer in writing, at least 20 days prior to the commencement of work, in accordance with 40 CFR 61, Subpart M, and state and local requirements to include the mandatory "Notification of Demolition and Renovation Record" form and other required notification documents. Notification shall be by Certified Mail, Return Receipt Requested. The Contractor shall furnish copies of the receipts to the Contracting Officer, in writing, prior to the commencement of work. A copy of the rental company's written acknowledgment and agreement shall be provided as required by paragraph RENTAL EQUIPMENT. For licenses, permits, and notifications that the Contractor is responsible for obtaining, the Contractor shall pay any associated fees or other costs incurred.

1.14.2 Litigation and Notification

The Contractor shall notify the Contracting Officer if any of the following occur:

- a. The Contractor or any of the subcontractors are served with notice of violation of any law, regulation, permit or license which relates to this contract;
- b. Proceedings are commenced which could lead to revocation of related permits or licenses; permits, licenses or other Government authorizations relating to this contract are revoked;
- c. Litigation is commenced which would affect this contract;
- d. The Contractor or any of the subcontractors become aware that their equipment or facilities are not in compliance or may fail to comply in the future with applicable laws or regulations.

1.15 PERSONAL PROTECTIVE EQUIPMENT

Unlimited sets of personal protective equipment shall be made available to the Contracting Officer and authorized visitors for entry to the regulated area. Contracting Officer and authorized visitors shall be provided with training equivalent to that provided to Contractor employees in the selection, fitting, and use of the required personal protective equipment and the site safety and health requirements. Contractor workers shall be provided with personal protective clothing and equipment and the Contractor shall ensure that it is worn properly. The Contractor's Designated IH and Designated Competent Person shall select and approve all the required personal protective clothing and equipment to be used.

1.15.1 Respirators

Respirators shall be in accordance with paragraph RESPIRATORY PROTECTION PROGRAM.

1.15.2 Whole Body Protection

Personnel exposed to airborne concentrations of asbestos that exceed the PELs, or for all OSHA Classes of work for which a required negative exposure assessment is not produced, shall be provided with whole body protection and such protection shall be worn properly. The Contractor's Designated IH and Competent Person shall select and approve the whole body protection to be used. The Competent Person shall examine work suits worn by employees at least once per work shift for rips or tears that may occur during performance of work. When rips or tears are detected while an employee is working, rips and tears shall be immediately mended, or the work suit shall be immediately replaced. Disposable whole body protection shall be disposed of as asbestos contaminated waste upon exiting from the regulated area. Reusable whole body protection worn shall be either disposed of as asbestos contaminated waste upon exiting from the regulated area or be properly laundered in accordance with 29 CFR 1926, Section .1101.

Whole body protection used for asbestos abatement shall not be removed from the worksite by a worker to be cleaned. Recommendations made by the Contractor's Designated IH to downgrade whole body protection shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person, in consultation with the Designated IH, has the authority to take immediate action to upgrade or downgrade whole body protection when there is an immediate danger to the health and safety of the wearer.

1.15.2.1 Coveralls

Disposable-breathable coveralls with a zipper front shall be provided. Sleeves shall be secured at the wrists, and foot coverings secured at the ankles.

1.15.2.2 Gloves

Gloves shall be provided to protect the hands. Where there is the potential for hand injuries (i.e., scrapes, punctures, cuts, etc.) a suitable glove shall be provided and used.

1.15.2.3 Foot Coverings

Cloth socks shall be provided and worn next to the skin. Footwear, as required by OSHA and EM 385-1-1, that is appropriate for safety and health

hazards in the area shall be worn. Rubber boots shall be used in moist or wet areas. Reusable footwear removed from the regulated area shall be thoroughly decontaminated or disposed of as ACM waste. Disposable protective foot covering shall be disposed of as ACM waste. If rubber boots are not used, disposable foot covering shall be provided.

1.15.2.4 Head Covering

Hood type disposable head covering shall be provided. In addition, protective head gear (hard hats) shall be provided as required. Hard hats shall only be removed from the regulated area after being thoroughly decontaminated.

1.15.2.5 Protective Eye Wear

Eye protection provided shall be in accordance with ANSI Z87.1.

1.16 HYGIENE FACILITIES AND PRACTICES

The Contractor shall establish a decontamination area for the decontamination of employees, material and equipment. The Contractor shall ensure that employees enter and exit the regulated area through the decontamination area.

1.16.1 Shower Facilities

Shower facilities, when provided, shall comply with 29 CFR 1910, Section .141(d)(3).

1.16.2 3-Stage Decontamination Area

A temporary negative pressure decontamination unit that is adjacent and attached in a leak-tight manner to the regulated area shall be provided.. The decontamination unit shall have an equipment room and a clean room separated by a shower that complies with 29 CFR 1910, Section .141 (unless the Contractor can demonstrate that such facilities are not feasible). Equipment and surfaces of containers filled with ACM shall be cleaned prior to removing them from the equipment room or area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste. Two separate lockers shall be provided for each asbestos worker, one in the equipment room and one in the clean room. Hot water service may be secured from the building hot water system provided backflow protection is installed by the Contractor at the point of connection. The Contractor shall provide a minimum of one showers. Instantaneous type in-line water heater may be incorporated at each shower head in lieu of hot water heater, upon approval by the Contracting Officer. Flow and temperature controls shall be located within the shower and shall be adjustable by the user. The wastewater pump shall be sized for 1.25 times the showerhead flow-rate at a pressure head sufficient to satisfy the filter head loss and discharge line losses. The pump shall supply a minimum 25 gpm flow with 35 ft. of pressure head. Used shower water shall be collected and filtered to remove asbestos contamination. Filters and residue shall be disposed of as asbestos contaminated material. Filtered water shall be discharged to the sanitary system. Wastewater filters shall be installed in series with the first stage pore size of 20 microns and the second stage pore size of 5 microns. The floor of the decontamination unit's clean room shall be kept dry and clean at all times. Water from the shower shall not be allowed to wet the floor in the clean room. Surfaces of the clean room and shower shall be wet-wiped 2 times after each shift change with a disinfectant

solution. Proper housekeeping and hygiene requirements shall be maintained. Soap and towels shall be provided for showering, washing and drying. Any cloth towels provided shall be disposed of as ACM waste or shall be laundered in accordance with 29 CFR 1926, Section .1101.

1.16.3 Decontamination Area Entry Procedures

The Contractor shall ensure that employees entering the decontamination area through the clean room or clean area:

- a. Remove street clothing in the clean room or clean area and deposit it in lockers.
- b. Put on protective clothing and respiratory protection before leaving the clean room or clean area.
- c. Pass through the equipment room to enter the regulated area.

1.16.4 Decontamination Area Exit Procedures

The Contractor shall ensure that the following procedures are followed:

- a. Before leaving the regulated area, respirators shall be worn while employees remove all gross contamination and debris from their work clothing using a HEPA vacuum.
- b. Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers (see Detail Sheets 9 and 14) for disposal and/or laundering.
- c. Employees shall not remove their respirators in the equipment room.
- d. Employees shall shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, the Contractor shall ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.
- e. After showering, employees shall enter the clean room before changing into street clothes.

1.16.5 Smoking

Smoking, if allowed by the Contractor, shall only be permitted in designated areas approved by the Contracting Officer.

1.17 REGULATED AREAS

All Class I, II, and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they shall demarcate the regulated area.

Access to regulated areas shall be limited to authorized persons. The Contractor shall control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

1.18 WARNING SIGNS AND TAPE

Warning signs and tape printed in English shall be provided at the regulated boundaries and entrances to regulated areas. The Contractor shall ensure that all personnel working in areas contiguous to regulated areas comprehend the warning signs. Signs shall be located to allow personnel to read the signs and take the necessary protective steps required before entering the area. Warning signs shall be in vertical format conforming to 29 CFR 1910 and 29 CFR 1926, Section .1101, a minimum of 20 by 14 inches, and displaying the following legend in the lower panel:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

Spacing between lines shall be at least equal to the height of the upper of any two lines.

1.19 WARNING LABELS

Warning labels shall be affixed to all asbestos disposal containers used to contain asbestos materials, scrap, waste debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to requirements are acceptable. Warning labels shall conform to 29 CFR 1926, Section .1101 and shall be of sufficient size to be clearly legible displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

1.20 LOCAL EXHAUST VENTILATION

Local exhaust ventilation units shall conform to ANSI Z9.2 and 29 CFR 1926, Section .1101. Filters on local exhaust system equipment shall conform to ANSI Z9.2 and UL 586. Filter shall be UL labeled.

1.21 TOOLS

Vacuums shall be leak proof to the filter, equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the ACM waste material. Power tools shall not be used to remove ACM unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system, or has otherwise been approved for use by the Contracting Officer. Residual asbestos shall be removed from reusable tools prior to storage and reuse. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

1.22 RENTAL EQUIPMENT

If rental equipment is to be used, written notification shall be provided to the rental agency, concerning the intended use of the equipment, the possibility of asbestos contamination of the equipment and the steps that will be taken to decontaminate such equipment. A written acceptance of the terms of the Contractor's notification shall be obtained from the rental agency.

1.23 AIR MONITORING EQUIPMENT

The Contractor's Designated IH shall approve air monitoring equipment to be used to collect samples. The equipment shall include, but shall not be limited to:

- a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute when equipped with a sampling train of tubing and filter cassette.
- b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute when equipped with a sampling train of tubing and filter cassette, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps shall also be equipped with an automatic flow control unit which shall maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
- c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands, to be used with low flow pumps in accordance with 29 CFR 1926, Section .1101 for personal air sampling.
- d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands, to be used with high flow pumps when conducting environmental area sampling using NIOSH Pub No. 84-100 Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).
- e. Appropriate plastic tubing to connect the air sampling pump to the selected filter cassette.
- f. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

1.24 EXPENDABLE SUPPLIES

1.24.1 Glovebag

Glovebags shall be provided as described in 29 CFR 1926, Section .1101. The glovebag assembly shall be 6 mil thick plastic, prefabricated and seamless at the bottom with preprinted OSHA warning label.

1.24.2 Duct Tape

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container shall be provided.

1.24.3 Disposal Containers

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers shall be provided for ACM wastes as required by 29 CFR 1926 Section .1101.

1.24.4 Disposal Bags

Leak-tight bags, 6 mil thick, shall be provided for placement of asbestos generated waste.

1.24.5 Sheet Plastic

Sheet plastic shall be polyethylene of 6 mil minimum thickness and shall be provided in the largest sheet size necessary to minimize seams. Film shall conform to ASTM D 4397, except as specified below:

1.24.5.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets shall be provided. Film shall be black and shall conform to the requirements of NFPA 701.

1.24.5.2 Reinforced

Reinforced sheets shall be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

1.24.6 Amended Water

Amended water shall meet the requirements of ASTM D 1331.

1.24.7 Mastic Removing Solvent

Mastic removing solvent shall be nonflammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite shall have a flash point greater than 140 degrees F.

1.24.8 Leak-tight Wrapping

Two layers of 6 mil minimum thick polyethylene sheet stock shall be used for the containment of removed asbestos-containing components or materials such as reactor vessels, large tanks, boilers, insulated pipe segments and other materials too large to be placed in disposal bags. Upon placement of the ACM component or material, each layer shall be individually leak-tight sealed with duct tape.

1.24.9 Wetting Agents

Removal encapsulant (a penetrating encapsulant) shall be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant shall be capable of wetting the ACM and retarding fiber release

during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS.

1.24.10 Strippable Coating

Strippable coating in aerosol cans shall be used to adhere to surfaces and to be removed cleanly by stripping, at the completion of work. This work shall only be done in well ventilated areas.

1.25 MISCELLANEOUS ITEMS

A sufficient quantity of other items, such as, but not limited to: scrapers, brushes, brooms, staple guns, tarpaulins, shovels, rubber squeegees, dust pans, other tools, scaffolding, staging, enclosed chutes, wooden ladders, lumber necessary for the construction of containments, UL approved temporary electrical equipment, material and cords, ground fault circuit interrupters, water hoses of sufficient length, fire extinguishers, first aid kits, portable toilets, logbooks, log forms, markers with indelible ink, spray paint in bright color to mark areas, project boundary fencing, etc., shall be provided.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent and shall meet the following requirements:

ALL ENCAPSULANTS

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Combustion Toxicity Zero Mortality	Univ. of Pittsburgh Protocol
Life Expectancy, 20 yrs Accelerated Aging Test	ASTM C 732
Permeability, Minimum 0.4 perms	ASTM E 96

Additional Requirements for Lockdown Encapsulant

Requirement	Test Standard
Fire Resistance, Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E 119
Bond Strength, 100 pounds of force/foot (Tests compatibility with cementitious and fibrous fireproofing)	ASTM E 736

ALL ENCAPSULANTS

Requirement

Test Standard

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Asbestos abatement work tasks shall be performed as shown on the drawings, as summarized in paragraph DESCRIPTION OF WORK and including Table 1 and the Contractor's Accident Prevention Plan, Asbestos Hazard Abatement Plan, and the Activity Hazard Analyses. The Contractor shall use the engineering controls and work practices required in 29 CFR 1926, Section .1101(g) in all operations regardless of the levels of exposure. Personnel shall wear and utilize protective clothing and equipment as specified. The Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area. All hot work (burning, cutting, welding, etc.) shall be conducted under controlled conditions in conformance with 29 CFR 1926, Section .352, Fire Prevention. Personnel of other trades, not engaged in asbestos abatement activities, shall not be exposed at any time to airborne concentrations of asbestos unless all the administrative and personal protective provisions of the Contractor's Accident Prevention Plan are complied with. Power to the regulated area shall be locked-out and tagged in accordance with 29 CFR 1910, and temporary electrical service with ground fault circuit interrupters shall be provided as needed. Temporary electrical service shall be disconnected when necessary for wet removal. The Contractor shall stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. The Contractor shall correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work shall resume only upon notification by the Contracting Officer. Corrective actions shall be documented.

3.2 PROTECTION OF ADJACENT WORK OR AREAS TO REMAIN

Asbestos abatement shall be performed without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government, as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, work shall stop in all effected areas immediately and the spill shall be cleaned. When satisfactory visual inspection and air sampling analysis results are obtained and have been evaluated by the Contractor's Designated IH and the Contracting Officer, work shall proceed.

3.3 OBJECTS

3.3.1 Removal of Mobile Objects

Mobile objects, furniture, and equipment will be removed from housing units by the tenants before asbestos abatement work begins.

3.4 BUILDING VENTILATION SYSTEM AND CRITICAL BARRIERS

Building ventilating systems supplying air into or returning air out of a regulated area shall be shut down and isolated by lockable switch or other positive means in accordance with 29 CFR 1910, Section.147. Air-tight critical barriers shall be installed on building ventilating openings located inside the regulated area that supply or return air from the building ventilation system or serve to exhaust air from the building. The critical barriers shall consist of air-tight rigid covers for building ventilation supply and exhaust grills where the ventilation system is required to remain in service during abatement. Edges to wall, ceiling and floor surfaces shall be sealed with industrial grade duct tape. Critical barriers shall be installed as shown on drawings and appended SET-UP DETAIL SHEETS.

3.5 PRECLEANING

Surfaces shall be cleaned by HEPA vacuum and adequately wet wiped prior to establishment of containment.

3.6 METHODS OF COMPLIANCE

3.6.1 Mandated Practices

The Contractor shall employ proper handling procedures in accordance with 29 CFR 1926 and 40 CFR 61, Subpart M, and the specified requirements. The specific abatement techniques and items identified shall be detailed in the Contractor's Asbestos Hazard Abatement Plan including, but not limited to, details of construction materials, equipment, and handling procedures. The Contractor shall use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters to collect debris and dust containing ACM.
- b. Wet methods or wetting agents to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup; except where it can be demonstrated that the use of wet methods is unfeasible due to, for example, the creation of electrical hazards, equipment malfunction, and in roofing.
- c. Prompt clean-up and disposal in leak-tight containers of wastes and debris contaminated with asbestos.
- d. Inspection and repair of polyethylene in work and high traffic areas.
- e. Cleaning of equipment and surfaces of containers filled with ACM prior to removing them from the equipment room or area.

3.6.2 Control Methods

The Contractor shall use the following control methods to comply with the PELs:

- a. Local exhaust ventilation equipped with HEPA filter dust collection systems;
- b. Enclosure or isolation of processes producing asbestos dust;
- c. Ventilation of the regulated area to move contaminated air away

from the breathing zone of employees and toward a filtration or collection device equipped with a HEPA filter;

- d. Use of other work practices and engineering controls;
- e. Where the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the PELs, the Contractor shall use them to reduce employee exposure to the lowest levels attainable by these controls and shall supplement them by the use of respiratory protection that complies with paragraph, RESPIRATORY PROTECTION PROGRAM.

3.6.3 Unacceptable Practices

The following work practices and engineering controls shall not be used for work related to asbestos or for work which disturbs ACM, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- b. Compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
- c. Dry sweeping, shoveling, or other dry clean-up of dust and debris containing ACM.
- d. Employee rotation as a means of reducing employee exposure to asbestos.

3.6.4 Class I Work Procedures

In addition to requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

- a. A Competent Person shall supervise the installation and operation of the control system.
- b. For jobs involving the removal of more than 25 feet or 10 square feet of TSI or surfacing material, the Contractor shall place critical barriers over all openings to the regulated area.
- c. HVAC systems shall be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.
- d. Impermeable dropcloths (6 mil or greater thickness) shall be placed on surfaces beneath all removal activity.
- e. Objects within the regulated area shall be handled as specified in paragraph OBJECTS.
- f. Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area shall be ventilated to move contaminated air away from the employee's breathing zone toward a HEPA unit or collection device.

3.6.5 Specific Control Methods for Class I Work

In addition to requirements of paragraph Class I Work Procedures, Class I asbestos work shall be performed using the control methods identified in the subparagraphs below.

3.6.5.1 Negative Pressure Enclosure (NPE) System

The system shall provide at least 4 air changes per hour inside the containment. The local exhaust unit equipment shall be operated 24 hours per day until the containment is removed, and shall be leak-proof to the filter and equipped with HEPA filters. Air movement shall be directed away from the employees and toward a HEPA filtration device. The NPE shall be smoke tested for leaks at the beginning of each shift. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Pressure differential shall be monitored continuously, 24 hours per day, with an automatic manometric recording instrument. Pressure differential recordings shall be provided daily on the same day collected. Readings shall be reviewed by the Contractor's Designated Competent Person and IH prior to submittal. The Contracting Officer shall be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system shall not be used as the local exhaust system for the regulated area. The local exhaust system shall terminate outdoors unless an alternate arrangement is allowed by the Contract Officer. All filters used shall be new at the beginning of the project and shall be periodically changed as necessary and disposed of as ACM waste.

3.6.5.2 Glovebag Systems

The glovebag system shall be used to remove ACM from straight runs of piping and elbows and other connections. Glovebags shall be used without modification and shall be smoke-tested for leaks and any leaks sealed prior to use. Glovebags shall be installed to completely cover the circumference of pipe or other structures where the work is to be done. Glovebags shall be used only once and shall not be moved. Glovebags shall not be used on surfaces that have temperatures exceeding 150 degrees F. Prior to disposal, glovebags shall be collapsed by removing air within them using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent to the glovebag operation shall be wrapped and sealed in 2 layers of plastic or otherwise rendered intact. At least 2 persons shall perform Class I glovebag removal. Asbestos regulated work areas shall be established as specified and shown on detailed drawings and plans for glovebag abatement. Designated boundary limits for the asbestos work shall be established with rope or other continuous barriers and all other requirements for asbestos control areas shall be maintained, including area signage and boundary warning tape.

- a. In addition to requirements for negative pressure glovebag systems above, the Contractor shall attach HEPA vacuum systems or other devices to the bag to prevent collapse during removal of ACM from straight runs of piping and elbows and other connections.
- b. The negative pressure glove boxes used to remove ACM from pipe runs shall be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure shall be created in the system using a HEPA

filtration system. The box shall be smoke tested for leaks prior to each use.

3.6.5.3 Wrap and Cut Operation

Prior to cutting pipe, the asbestos-containing insulation shall be wrapped with polyethylene and securely sealed with duct tape to prevent asbestos becoming airborne as a result of the cutting process. The following steps shall be taken: install glovebag, strip back sections to be cut 6 inches from point of cut, and cut pipe into manageable sections.

3.6.6 Class II Work

In addition to the requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

- a. A Competent Person shall supervise the work.
- b. For indoor work, critical barriers shall be placed over all openings to the regulated area.
- c. Impermeable dropcloths shall be placed on surfaces beneath all removal activity.

3.6.7 Specific Control Methods for Class II Work

In addition to requirements of paragraph Class II Work, Class II work shall be performed using the following methods:

3.6.7.1 Flooring Materials (Step Tread)

When removing step tread which contain ACM, the Contractor shall use the following practices. Step tread shall be removed by adequately wet methods. Tiles shall be removed intact (if possible); wetting is not required when tiles are heated and removed intact. Flooring or its backing shall not be sanded. Scraping of residual adhesive and/or backing shall be performed using wet methods. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. The Contractor shall use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) to clean floors.

3.6.7.2 Window Caulk

Prepare regulated work area as previously specified. Spread one layer of 6-mil plastic sheeting on the floor of the work area extending out in all directions. Carefully remove the asbestos caulk in small sections, as it is removed place in disposal bag. Make every effort to keep the asbestos caulk from falling to the work area floor below.

3.6.7.3 Duct Vibration Cloth

Prepare regulated work area as previously specified. Spread one layer of 6-mil plastic sheeting on the floor of the work area extending out in all directions. Carefully remove the asbestos cloth in small sections, as it is removed place in disposal bag. Make every effort to keep the asbestos cloth from falling to the work area floor below.

3.6.7.4 Other Class II Jobs

The Contractor shall use the following work practices when performing Class II removal of ACM: The material shall be thoroughly wetted with amended water prior and during its removal. The material shall be removed in an intact state. Cutting, abrading or breaking the material is prohibited. The ACM removed shall be immediately bagged or wrapped.

3.6.8 Cleaning After Asbestos Removal

After completion of all asbestos removal work, surfaces from which ACM has been removed shall be wet wiped or sponged clean, or cleaned by some equivalent method to remove all visible residue. Run-off water shall be collected and filtered through a dual filtration system. A first filter shall be provided to remove fibers 20 micrometers and larger, and a final filter provided that removes fibers 5 micrometers and larger. After the gross amounts of asbestos have been removed from every surface, remaining visible accumulations of asbestos on floors shall be collected using plastic shovels, rubber squeegees, rubber dustpans, and HEPA vacuum cleaners as appropriate to maintain the integrity of the regulated area. When TSI and surfacing material has been removed, workmen shall use HEPA vacuum cleaners to vacuum every surface. Surfaces or locations which could harbor accumulations or residual asbestos dust shall be checked after vacuuming to verify that no asbestos-containing material remains; and shall be re-vacuumed as necessary to remove the ACM.

3.7 FINAL CLEANING AND VISUAL INSPECTION

Upon completion of abatement, the regulated area shall be cleaned by collecting, packing, and storing all gross contamination. A final cleaning shall be performed using HEPA vacuum and wet cleaning of all exposed surfaces and objects in the regulated area. Upon completion of the cleaning, the Contractor shall conduct a visual pre-inspection of the cleaned area in preparation for a final inspection before final air clearance monitoring and recleaning, as necessary. Upon completion of the final cleaning, the Contractor and the Contracting Officer shall conduct a final visual inspection of the cleaned regulated area in accordance with ASTM E 1368 and document the results on the Final Cleaning and Visual Inspection. If the Contracting Officer rejects the clean regulated area as not meeting final cleaning requirements, the Contractor shall reclean as necessary and have a follow-on inspection conducted with the Contracting Officer. Recleaning and follow-up reinspection shall be at the Contractor's expense.

3.8 LOCKDOWN

Prior to removal of plastic barriers and after clean-up of gross contamination and final visual inspection, a post removal (lockdown) encapsulant shall be spray applied to ceiling, walls, floors, and other surfaces in the regulated area.

3.9 EXPOSURE ASSESSMENT AND AIR MONITORING

3.9.1 General Requirements For Exposure

Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926, Section .1101, the Contractor's air monitoring plan, and as specified. Personal exposure air monitoring (collected at the breathing zone) that is representative of the exposure of each employee who is assigned to work within a regulated area shall be performed by the Contractor's Designated IH.

Breathing zone samples shall be taken for at least 25 percent of the workers in each shift, or a minimum of 2, whichever is greater. Air monitoring results at the 95 percent confidence level shall be calculated as shown in Table 2 at the end of this section. The Contractor shall provide an onsite independent testing laboratory with qualified analysts and appropriate equipment to conduct sample analyses of air samples using the methods prescribed in 29 CFR 1926, Section.1101, to include NIOSH Pub No. 84-100 Method 7400. Preabatement and abatement environmental air monitoring shall be performed by the Contractor's Designated IH and Contracting Officer's IH. Final clearance environmental air monitoring, shall be performed by the Contractor's Designated IH. Environmental and final clearance air monitoring shall be performed using NIOSH Pub No. 84-100 Method 7400 (PCM) with optional confirmation of results by NIOSH Pub No. 84-100 Method 7402 (TEM). For environmental and final clearance, air monitoring shall be conducted at a sufficient velocity and duration to establish the limit of detection of the method used at 0.005 f/cc. Confirmation of asbestos fiber concentrations (asbestos f/cc) from environmental and final clearance samples collected and analyzed by NIOSH Pub No. 84-100 Method 7400 (total f/cc) may be conducted using TEM in accordance with NIOSH Pub No. 84-100 Method 7402. When such confirmation is conducted, it shall be from the same sample filter used for the NIOSH Pub No. 84-100 Method 7400 PCM analysis. For all Contractor required environmental or final clearance air monitoring, confirmation of asbestos fiber concentrations, using NIOSH Pub No. 84-100 Method 7402, shall be at the Contractor's expense. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. Results of breathing zone samples shall be posted at the job site and made available to the Contracting Officer. The Contractor shall maintain a fiber concentration inside a regulated area less than or equal to 0.1 f/cc expressed as an 8 hour, time-weighted average (TWA) during the conduct of the asbestos abatement. If fiber concentration rises above 0.1 f/cc, work procedures shall be investigated with the Contracting Officer to determine the cause. At the discretion of the Contracting Officer, fiber concentration may exceed 0.1 f/cc but shall not exceed 1.0 f/cc expressed as an 8-hour TWA. The Contractor's workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should either an environmental concentration of 1.0 f/cc expressed as an 8-hour TWA or a personal excursion concentration of 1.0 f/cc expressed as a 30-minute sample occur inside a regulated work area, the Contractor shall stop work immediately, notify the Contracting Officer, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Work shall not restart until authorized by the Contracting Officer.

3.9.2 Initial Exposure Assessment

The Contractor's Designated IH shall conduct an exposure assessment immediately before or at the initiation of an asbestos abatement operation to ascertain expected exposures during that operation. The assessment shall be completed in time to comply with the requirements which are triggered by exposure data or the lack of a negative exposure assessment, and to provide information necessary to assure that all control systems planned are appropriate for that operation. The assessment shall take into consideration both the monitoring results and all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace, or of the operations of the Contractor which indicate the levels of airborne asbestos likely to be encountered on the job. For Class I asbestos work, until the employer conducts exposure monitoring and documents that employees on that job will

not be exposed in excess of PELs, or otherwise makes a negative exposure assessment, the Contractor shall presume that employees are exposed in excess of the PEL-TWA and PEL-Excursion Limit.

3.9.3 Negative Exposure Assessment

The Contractor shall provide a negative exposure assessment for the specific asbestos job which will be performed. The negative exposure assessment shall be provided within days of the initiation of the project and conform to the following criteria:

- a. Objective Data: Objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the PEL-TWA and PEL-Excursion Limit under those work conditions having the greatest potential for releasing asbestos.
- b. Prior Asbestos Jobs: Where the Contractor has monitored prior asbestos jobs for the PEL and the PEL-Excursion Limit within 12 months of the current job, the monitoring and analysis were performed in compliance with asbestos standard in effect; the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the Contractor's current operations; the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job; and these data show that under the conditions prevailing and which will prevail in the current workplace, there is a high degree of certainty that the monitoring covered exposure from employee exposures will not exceed the PEL-TWA and PEL-Excursion Limit.
- c. Initial Exposure Monitoring: The results of initial exposure monitoring of the current job, made from breathing zone air samples that are representative of the 8-hour PEL-TWA and 30-minute short-term exposures of each employee. The monitoring covered exposure from operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

3.9.4 Independent Environmental Monitoring

The Government has retained an independent air monitoring firm to perform pre-abatement during abatementfinal clearance air monitoring. The air monitoring contractor has been provided a copy of the contract that includes this abatement work. The abatement contractor will provide the air monitoring contractor with an up-to-date copy of the accepted Asbestos Hazard Abatement Plan, Accident Prevention Plan and pertinent detailed drawings. The air monitoring contractor is required to comply with the abatement contractor's safety and health requirements. The abatement contractor will coordinate all onsite activities with the air monitoring contractor, the COR, and other affected parties as directed by the COR. The abatement contractor will provide the air monitoring contractor with an up-to-date schedule of abatement contractor work activities. The air monitoring contractor will coordinate with the abatement contractor and the COR during the performance Government required air monitoring. The abatement contractor is responsible for performing exposure assessment and

personal air monitoring of abatement contractor's work. The air monitoring contractor is responsible for performing these tasks for its employee.

3.9.5 Preabatement Environmental Air Monitoring

Preabatement environmental air monitoring shall be established 1 day prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins. As a minimum, preabatement air samples shall be collected using NIOSH Pub No. 84-100 Method 7400, PCM at these locations: outside the building; inside the building, but outside the regulated area perimeter; and inside each regulated work area. One sample shall be collected for every 2000 square feet of floor space. At least 2 samples shall be collected outside the building: at the exhaust of the HEPA unit; and downwind from the abatement site. The PCM samples shall be analyzed within 24 hours; and if any result in fiber concentration greater than 0.01 f/cc, asbestos fiber concentration shall be confirmed using NIOSH Pub No. 84-100 Method 7402 (TEM).

3.9.6 Environmental Air Monitoring During Abatement

Until an exposure assessment is provided to the Contracting Officer, environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. The assessment shall demonstrate that the product or material containing asbestos minerals, or the abatement involving such product or material, cannot release airborne asbestos fibers in concentrations exceeding 0.01 f/cc as a TWA under those work conditions having the greatest potential for releasing asbestos. The monitoring shall be at least once per shift at locations including, but not limited to, close to the work inside a regulated area; preabatement sampling locations; outside entrances to a regulated area; close to glovebag operations; representative locations outside of the perimeter of a regulated area; inside clean room; and at the exhaust discharge point of local exhaust system ducted to the outside of a containment (if used). If the sampling outside regulated area shows airborne fiber levels have exceeded background or 0.01 f/cc, whichever is greater, work shall be stopped immediately, and the Contracting Officer notified. The condition causing the increase shall be corrected. Work shall not restart until authorized by the Contracting Officer.

3.9.7 Final Clearance Air Monitoring

Prior to conducting final clearance air monitoring, the Contractor and the Contracting Officer shall conduct a final visual inspection of the regulated area where asbestos abatement has been completed. Final clearance air monitoring shall not begin until acceptance of the Contractor's final cleaning by the Contracting Officer. The Contractor's Designated IH shall conduct final clearance air monitoring using aggressive air sampling techniques as defined in EPA 560/5-85-024 or as otherwise required by federal or state requirements. The sampling and analytical method used will be NIOSH Pub No. 84-100 Method 7400 (PCM) and Table 3 with confirmation of results by NIOSH Pub No. 84-100 Method 7402 (TEM), and the EPA TEM Method specified at 40 CFR 763 and Table 4.

3.9.7.1 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH Pub No. 84-100 Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, shall be less than 0.01 f/cc. The abatement inside the regulated

area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) shall be confirmed from that same filter using NIOSH Pub No. 84-100 Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning shall be repeated.

Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done.

3.9.7.2 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, the Contractor shall pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

3.9.8 Air-Monitoring Results and Documentation

Air sample fiber counting shall be completed and results provided within 24 hours (breathing zone samples), and hours (environmental/clearance monitoring) after completion of a sampling period. The Contracting Officer shall be notified immediately of any airborne levels of asbestos fibers in excess of established requirements. Written sampling results shall be provided within 5 working days of the date of collection. The written results shall be signed by testing laboratory analyst, testing laboratory principal and the Contractor's Designated IH. The air sampling results shall be documented on a Contractor's daily air monitoring log. The daily air monitoring log shall contain the following information for each sample:

- a. Sampling and analytical method used;
- b. Date sample collected;
- c. Sample number;
- d. Sample type: BZ = Breathing Zone (Personal), P = Preabatement, E = Environmental, C = Abatement Clearance;
- e. Location/activity/name where sample collected;
- f. Sampling pump manufacturer, model and serial number, beginning flow rate, end flow rate, average flow rate (L/min);
- g. Calibration date, time, method, location, name of calibrator, signature;
- h. Sample period (start time, stop time, elapsed time (minutes));
- i. Total air volume sampled (liters);
- j. Sample results (f/cc and S/mm square) if EPA methods are required for final clearance;
- k. Laboratory name, location, analytical method, analyst, confidence level. In addition, the printed name and a signature and date block for the Industrial Hygienist who conducted the sampling and for the Industrial Hygienist who reviewed the daily air monitoring log verifying the accuracy of the information.

3.10 CLEARANCE CERTIFICATION

When asbestos abatement is complete, ACM waste is removed from the regulated areas, and final clean-up is completed, the Contracting Officer will certify the areas as safe before allowing the warning signs and boundary warning tape to be removed. After final clean-up and acceptable airborne concentrations are attained, but before the HEPA unit is turned off and the containment removed, the Contractor shall remove all pre-filters on the building HVAC system and provide new pre-filters. The Contractor shall dispose of such filters as asbestos contaminated materials. HVAC, mechanical, and electrical systems shall be re-established in proper working order. The Contractor and the Contracting Officer shall visually inspect all surfaces within the containment for residual material or accumulated debris. The Contractor shall reclean all areas showing dust or residual materials. The Contracting Officer will certify in writing that the area is safe before unrestricted entry is permitted. The Government will have the option to perform monitoring to certify the areas are safe before entry is permitted.

3.11 CLEANUP AND DISPOSAL

3.11.1 Title to ACM Materials

ACM material resulting from abatement work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified and in accordance with applicable federal, state and local regulations.

3.11.2 Collection and Disposal of Asbestos

All ACM waste shall be collected and including contaminated wastewater filters, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing, shall be collected and placed in leak-tight containers such as double plastic bags sealed double wrapped polyethylene sheet ; sealed fiberboard boxes ; or other approved containers. Waste within the containers shall be wetted in case the container is breeched. Asbestos-containing waste shall be disposed of at an EPA, state and local approved asbestos landfill off Government property. For temporary storage, sealed impermeable containers shall be stored in an asbestos waste load-out unit or in a storage/transportation conveyance (i.e., dumpster, roll-off waste boxes, etc.) in a manner acceptable to and in an area assigned by the Contracting Officer. Procedure for hauling and disposal shall comply with 40 CFR 61, Subpart M, state, regional, and local standards.

3.11.3 Scale Weight Measurement

Scales used for measurement shall be public scales. Weighing shall be at a point nearest the work at which a public scale is available. Scales shall be standard truck scales of the beam type; scales shall be equipped with the type registering beam and an "over and under" indicator; and shall be capable of accommodating the entire vehicle. Scales shall be tested, approved and sealed by an inspector of the State of Virginia. Scales shall be calibrated and resealed as often as necessary and at least once every three months to ensure continuous accuracy. Vehicles used for hauling ACM shall be weighed empty daily at such time as directed and each vehicle shall bear a plainly legible identification mark.

3.11.4 Weigh Bill and Delivery Tickets

Copies of weigh bills and delivery tickets shall be submitted to the Contracting Officer during the progress of the work. The Contractor shall furnish the Contracting Officer scale tickets for each load of ACM weighed and certified. These tickets shall include tare weight; identification mark for each vehicle weighed; and date, time and location of loading and unloading. Tickets shall be furnished at the point and time individual trucks arrive at the worksite. A master log of all vehicle loading shall be furnished for each day of loading operations. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified weigh bills and/or certified tickets and manifests of all ACM actually disposed by the Contractor for this contract.

3.11.5 Asbestos Waste Shipment Record

The Contractor shall complete and provide the Contracting Officer final completed copies of the Waste Shipment Record for all shipments of waste material as specified in 40 CFR 61, Subpart M and other required state waste manifest shipment records, within 3 days of delivery to the landfill.

Each Waste Shipment Record shall be signed and dated by the Contractor , the waste transporter and disposal facility operator.

TABLE 1

INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet _____ of _____

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER _____
2. LOCATION OF WORK TASK _____

3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: _____

 - a. Type of Asbestos _____
 - b. Percent asbestos content _____%
4. ABATEMENT TECHNIQUE TO BE USED _____
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK _____
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK
Friable _____ Non-friable Category I _____
Non-friable Category II _____
7. FORM _____ and CONDITION OF ACM: GOOD _____ FAIR _____ POOR _____
8. QUANTITY: METERS _____, SQUARE METERS _____
- 8a. QUANTITY: LINEAR FT. _____, SQUARE FT. _____
9. RESPONSE ACTION DETAIL SHEET NUMBER FOR WORK TASK _____
10. SET-UP DETAIL SHEET NUMBERS
FOR WORK TASK _____, _____, _____, _____,
_____, _____, _____, _____.

NOTES:

- (1) Numeric sequence of individual work tasks (1,2,3,4, etc.) for each regulated area. Each category of EPA friability/OSHA class has a separate task.
- (2) Specific location of work (building, floor, area, e.g., Building 1421, 2nd Floor, Rm 201)
- (3) A description of material to be abated (example: horizontal pipe, cement wall panels, tile, stucco, etc.) type of asbestos (chrysotile, amosite, crocidolite, etc.); and % asbestos content.
- (4) Technique to be used: Removal = REM; Encapsulation = ENCAP; Encasement = ENCAS; Enclosure = ENCL; Repair = REP.
- (5) Class designation: Class I, II, III, or IV (OSHA designation).
- (6) Friability of materials: Check the applicable EPA NESHAP friability designation.
- (7) Form: Interior or Exterior Architectural = IA or EA; Mechanical/Electrical = ME.
Condition: Good = G; Fair = F; Poor = P.
- (8) Quantity of ACM for each work task in meters or square meters.
- (8a) Quantity of ACM for each work task in linear feet or square feet.
- (9) Response Action Detail Sheet specifies the material to be abated and the methods to be used. There is only one Response Action Detail Sheet for each abatement task.
- (10) Set-up Detail Sheets indicate containment and control methods used in support of the response action (referenced in the selected Response Action Detail Sheet).

TABLE 2

FORMULA FOR CALCULATION OF THE 95 PERCENT CONFIDENCE LEVEL
(Reference: NIOSH 7400)

$$\text{Fibers/cc(01.95 percent CL)} = X + [(X) * (1.645) * (CV)]$$

Where: $X = ((E)(AC))/((V)(1000))$

$$E = ((F/Nf) - (B/Nb))/Af$$

CV = The precision value; 0.45 shall be used unless the analytical laboratory provides the Contracting Officer with documentation (Round Robin Program participation and results) that the laboratory's precision is better.

AC = Effective collection area of the filter in square millimeters

V = Air volume sampled in liters

E = Fiber density on the filter in fibers per square millimeter

F/Nf = Total fiber count per graticule field

B/Nb = Mean field blank count per graticule field

Af = Graticule field area in square millimeters

$$\text{TWA} = C1/T1 + C2/T2 = Cn/Tn$$

Where: C = Concentration of contaminant

T = Time sampled.

TABLE 3
NIOSH METHOD 7400
PCM ENVIRONMENTAL AIR SAMPLING PROTOCOL (NON-PERSONAL)

Sample Location	Minimum No. of Samples	Filter Pore Size (Note 1)	Min. Vol. (Note 2) (Liters)	Sampling Rate (liters/min.)
Inside Abatement Area	0.5/140 Square Meters (Notes 3 & 4)	0.45 microns	3850	2-16
Each Room in 1 Abatement Area Less than 140 Square meters		0.45 microns	3850	2-16
Field Blank	2	0.45 microns	0	0
Laboratory Blank	1	0.45 microns	0	0

Notes:

1. Type of filter is Mixed Cellulose Ester.
2. Ensure detection limit for PCM analysis is established at 0.005 fibers/cc.
3. One sample shall be added for each additional 140 square meters. (The corresponding I-P units are 5/1500 square feet).
4. A minimum of 5 samples are to be taken per abatement area, plus 2 field blanks.

TABLE 4

EPA AHERA METHOD: TEM AIR SAMPLING PROTOCOL

Location Sampled	Minimum No. of Samples	Filter Pore Size	Min. Vol. (Liters)	Sampling Rate (liters/min.)
Inside Abatement Area	5	0.45 microns	1500	2-16
Outside Abatement Area	5	0.45 microns	1500	2-16
Field Blank	2	0.45 microns	0	0
Laboratory Blank	1	0.45 microns	0	0

Notes:

1. Type of filter is Mixed Cellulose Ester.
2. The detection limit for TEM analysis is 70 structures/square mm.

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME _____ CONTRACT NO. _____
PROJECT ADDRESS _____
CONTRACTOR FIRM NAME _____
EMPLOYEE'S NAME _____, _____, _____,
(Print) (Last) (First) (MI)

Social Security Number: _____-_____-_____,

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH TYPES OF LUNG DISEASE AND CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NONSMOKING PUBLIC.

Your employer's contract for the above project requires that you be provided and you complete formal asbestos training specific to the type of work you will perform and project specific training; that you be supplied with proper personal protective equipment including a respirator, that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you. The Contractor's Designated Industrial Hygienist will check the block(s) for the type of formal training you have completed. Review the checked blocks prior to signing this certification.

FORMAL TRAINING:

_____ a. For Competent Persons and Supervisors: I have completed EPA's Model Accreditation Program (MAP) training course, "Contractor/Supervisor", that meets this State's requirements.

_____ b. For Workers:
_____ (1) For OSHA Class I work: I have completed EPA's MAP training course, "Worker", that meets this State's requirements.
_____ (2) For OSHA Class II work (where there will be abatement of more than one type of Class II materials, i.e., roofing, siding, floor tile, etc.): I have completed EPA's MAP training course, "Worker", that meets this State's requirements.
_____ (3) For OSHA Class II work (there will only be abatement of one type of Class II material):
_____ (a) I have completed an 8-hour training class on the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls of 29 CFR 1926, Section .1101(g) and hands-on training.
_____ (b) I have completed EPA's MAP training course, "Worker", that meets this State's requirements.

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

_____ c. Workers, Supervisors and the Designated Competent Person: I have completed annual refresher training as required by EPA's MAP that meets this State's requirements.

PROJECT SPECIFIC TRAINING:

_____ I have been provided and have completed the project specific training required by this Contract. My employer's Designated Industrial Hygienist and Designated Competent Person conducted the training.

RESPIRATORY PROTECTION:

_____ I have been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the dangers of handling and breathing asbestos dust and in the proper work procedures and use and limitations of the respirator(s) I will wear. I have been trained in and will abide by the facial hair and contact lens use policy of my employer.

RESPIRATOR FIT-TEST TRAINING:

_____ I have been trained in the proper selection, fit, use, care, cleaning, maintenance, and storage of the respirator(s) that I will wear. I have been fit-tested in accordance with the criteria in the Contractor's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

MEDICAL EXAMINATION:

_____ I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests, and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing personal protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. My employer's Industrial Hygienist evaluated the medical certification provided by the physician and checked the appropriate blank below. The physician determined that there:

_____ were no limitations to performing the required work tasks.

_____ were identified physical limitations to performing the required work tasks.

Date of the medical examination _____

Employee Signature _____ date _____

Contractor's Industrial

Hygienist Signature _____ date _____

-- End of Section --

SECTION 13281A

LEAD HAZARD CONTROL ACTIVITIES

03/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 1553	(1993) Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities
ASTM E 1613	(1999) Standard Test Method for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absorption (GFAAS) Techniques
ASTM E 1644	(1998) Practice for Hot Plate Digestion of Dust Wipe Samples for the Determination of Lead
ASTM E 1728	(1999) Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques
ASTM E 1729	(1999) Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques
ASTM E 1741	(2000) Preparation of Airborne Particulate Lead Samples Collected During Abatement and Construction Activities for Subsequent Analysis by Atomic Spectrometry
ASTM E 1792	(1996a) Wipe Sampling Materials for Lead in Surface Dust

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(1999) Methods of Fire Tests for Flame-Resistant Textiles and Films
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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 84-100	(1984; Supple 1985, 1987, 1988 & 1990) NIOSH Manual of Analytical Methods
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U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD 6780 (1995; Errata Aug 1996; Rev Ch. 7 - 1997) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

24 CFR 35 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for Construction

40 CFR 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

1.2 DEFINITIONS

- a. Lead Hazard Control Activity - Any construction work where a worker may be occupationally exposed to lead and procedures have to be followed to assure that: 1). Lead inside the lead hazard control area is cleaned up to appropriate levels and 2). Lead dust does not disperse outside the lead hazard control area at unacceptable levels.
- b. Public/Commercial Building - Buildings on real property, including residential real property, generally accessible to the public except target housing, child occupied facilities and industrial buildings. Examples include offices, stores/shopping centers, churches, schools, barracks, hospitals, museums, airports, hotels, convention centers.
- c. Industrial Building - Any building used for industrial purposes where normal operations inside the building may produce lead aerosol that will settle out on inside surfaces.
- d. Target Housing - Residential real property which is housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any one or more children age 6 years or under resides or is expected to reside in such housing for the elderly or persons with disabilities) or any 0 bedroom dwelling.
- e. Child-occupied Facility - Real property which is a building or portion of a building constructed prior to 1978 visited regularly by the same child, 6 years of age or under, on at least two different days, provided that each day's visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities include but are not limited to, day-care centers, preschools and kindergarten classrooms.

- f. Residential Real Property - Real property on which there is situated one or more residential dwellings used or occupied, or intended to be used or occupied, in whole or in part, as the home or residence of one or more persons.
- g. Group 1 Tasks - Activities performed on surfaces covered with paint at or above the laboratory's minimum detection limit for lead. The following activities are considered Group 1 Tasks and require appropriate protective measures in accordance with 29 CFR 1926.62: manual demolition, manual scraping, manual sanding, heat applications, general cleanup, power tool cleaning with dust collection system, and spray paint with lead-based paints.
- h. Group 2 Tasks - Activities performed on surfaces covered with paint at or above the laboratory's minimum detection limit for lead. The following activities are considered Group 2 Tasks and require appropriate protective measures in accordance with 29 CFR 1926.62: lead burning, using lead-containing mortar, power tool cleaning without dust collection system, rivet blasting, cleanup activities where dry expendable abrasives are used, and movement and removal of abrasive blasting enclosures.
- i. Group 3 Tasks - Activities performed on surfaces covered with paint at or above the laboratory's minimum detection limit for lead. The following activities are considered Group 3 Tasks and require appropriate protective measures in accordance with 29 CFR 1926.62: abrasive blasting welding, cutting and burning on steel structures.

1.3 DESCRIPTION OF WORK

The work covered by this section includes work tasks, on the individual work task data sheets at the end of this section, and the precautions specified in this section for the protection of workers, building occupants and the environments.

Work covered by this section includes but is not limited to Group 1, Group 2, and Group 3 Tasks, Trigger Operations, as outlined in 29 CFR 1926.62, performed on paint containing lead above the laboratory's minimum detection limit or on materials coated with paint containing lead, located at Historic Housing Phase 3 at Langley Air Force Base, Virginia.

The Contractor is responsible for developing a project approach by coordinating the requirements of this specification with the various subcontractors performing other components of the contract in order to execute the work. The work techniques selected by the Contractor and identified in the Lead Hazard Control Plan will determine the abatement measures necessary, if any. The project approach shall be based on historical data and experience with similar scope projects. The scope of work includes disposal of materials generated from execution of the contract

1.3.1 Protection of Existing Areas To Remain

All project work including, but not limited to, lead hazard work, storage, transportation, and disposal shall be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, the Contractor shall restore work and areas to the original condition at no additional cost to the Government.

1.3.2 Coordination with Other Work

The contractor shall coordinate lead hazard control activities with work being performed in adjacent areas. Coordination procedures shall be explained in the Contractor's Accident Prevention Plan and shall describe how the Contractor will prevent lead exposure to other contractors and/or Government personnel performing work unrelated to lead hazard control activities.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials and Equipment Expendable Supplies

A description of the materials, equipment and expendable supplies required; including Material Safety Data Sheets (MSDSs) for material brought onsite to perform the work.

Qualifications; G

A report providing evidence of qualifications and designating responsibilities for personnel and laboratories.

SD-06 Test Reports

Licences, Permits, and Notifications Accident Prevention Plan (APP); G,

A report describing how the Contractor will protect workers, building occupants, and building contents while performing lead hazard control activities; and how project clearance will be performed.

Sampling and Analysis

A log of the analytical results required for the sampling. The log shall be kept current.

Clearance Report

Report prepared by the QSHP.

1.5 QUALIFICATIONS

1.5.1 Qualifications and Organization Report

The Contractor shall furnish a qualification and organization report. The report shall describe the qualifications of the qualified safety and health professional (QSHP), onsite safety and health supervisor (OSHS), labor staff and the independent risk assessor. The report shall include an organization chart showing the Contractor's personnel by name and title and

project specific responsibilities and authorities. The report shall describe the qualifications of the laboratories selected for this project. The report shall be signed by the Contractor and the qualified safety and health professional to indicate that all personnel and laboratories comply with certification and experience requirements of this section and that project personnel have been given the authority to complete the tasks assigned to them.

1.5.2 Personnel and Subcontractor Responsibilities and Qualifications

1.5.2.1 Qualified Safety and Health Professional (QSHP)

The QSHP shall be responsible for development of project specific requirements in the Accident Prevention Plan (APP); supervise implementation of the APP requirements; visit the site as needed to verify effectiveness of the APP and to coordinate resolution of unknown situations that may develop as the work progresses; be available to provide consultation to the Onsite Safety and Health Supervisor (OSHS); review sampling and analytical results to evaluate occupational exposure levels, verify effectiveness of controls and determine if clearance requirements have been met. The QSHP shall have demonstrable experience with the implementation of occupational safety and health regulations. The QSHP shall be certified, and hold a current license, by the Commonwealth of Virginia as a Lead Risk Assessor, Lead Project Designer, and Lead Supervisor.

1.5.2.2 Lead Hazard Control Workers

Lead Hazard Control workers shall be responsible for performing the labor necessary to complete the lead hazard control activities required in this contract. Workers shall be certified, and hold a current license, by the Commonwealth of Virginia as a Lead Worker.

1.5.2.3 Independent Certified Risk Assessor

The independent Certified Risk Assessor shall be a subcontractor to the prime Contractor on the project. The risk assessor shall be responsible to perform the sampling and evaluating the analytical data to verify clearance levels have been achieved. The independent risk assessor shall sign the clearance report indicating clearance requirements for the contract have been met. The independent Certified Risk Assessor shall be certified, and hold a current license, by the Commonwealth of Virginia as a Lead Risk Assessor.

1.5.2.4 Testing Laboratories

The laboratory selected to perform analysis on paint chip, soil or dust wipe samples shall be accredited by EPA's National Lead Laboratory Accreditation Program (NLLAP). The laboratory selected perform analysis on worker exposure (industrial hygiene) samples shall be in the American Industrial Hygiene Association's Industrial Hygiene Laboratory Accreditation Program (IHLAP) and shall be successfully participating in the Proficiency Analytical Testing (PAT) program for lead.

1.5.2.5 Blood Lead Testing

The laboratory selected to perform analysis on worker blood samples shall be approved by OSHA and meet the requirements contained in http://www.osha-slc.gov/OCIS/toc_bloodlead.html.

1.5.2.6 Disposal Facility and Transporter

The Contractor shall furnish written evidence that the landfill to be used is approved for lead disposal by USEPA and state and local requirements. Copies of any required signed agreements between the Contractor (including subcontractors and transporters) and the lead disposal facility shall be provided.

1.6 REGULATORY REQUIREMENTS

In addition to the detailed requirements of this specification, work shall be performed in accordance with requirements of EM 385-1-1 and applicable regulations including, but not limited to 29 CFR 1910, 29 CFR 1926, especially Section .62, and the accepted Accident Prevention Plan with Appendices. Matters of interpretation of the standards shall be resolved to the satisfaction of and with the concurrence of, the Contracting Officer before starting work. Where these requirements vary, the most stringent shall apply.

1.7 ACCIDENT PREVENTION PLAN (APP)

1.7.1 APP Content and Organization

The Contractor's Accident Prevention Plan shall be organized into 5 parts, consisting of the overall plan and 4 appendices. The overall plan shall address each element in Appendix A of EM 385-1-1 in project specific detail. The elements are: a. Signature Sheet, b. Background Information, c. Statement of Safety and Health Policy, d. Responsibilities and Lines of Authorities, e. Subcontractors and Suppliers, f. Training, g. Safety and Health Inspections, h. Safety and Health Expectations, Incentive Programs and Compliance, i. Accident Reporting, j. Medical Support, k. Corporate Plans and Programs required by this contract, (HAZCOM, Respiratory Protection).

1.7.1.1 Lead Hazard Control Plan Appendix

The Lead Hazard Control Appendix shall address occupational exposure issues and shall describe the procedures to be followed to protect employees from lead hazards while performing lead hazard control activities. Each of the following elements shall be addressed in the lead hazard control appendix:

- a. The location and a brief description of each work activity that will emit lead into the workplace atmosphere. A description of any components containing lead shall be included and keyed to the project drawings.
- b. Description of equipment and materials, controls, crew size, worker responsibilities, and operating and maintenance procedures.
- c. Description and sketch of the Lead Hazard Control Areas, including decontamination areas.
- d. Description of the specific lead control methods and procedures to protect workers and other onsite contractors from lead exposure.
- e. Technologic equipment used to keep occupational exposure below the Permissible Exposure Limit and minimize worker exposure to lead (i.e., HEPA-filtered vacuum equipment/cleaners, special negative

air enclosure equipment and supplies, etc.)).

- f. Worker Exposure Assessment including methods and procedures to monitor and document worker exposure to lead. Worker exposure monitoring shall be broken into two parts in the plan. Part A: Initial Determination. The Contractor shall describe worker monitoring (if performed for the "initial determination" described in 29 CFR 1926 (.62) (d). Monitoring for the initial determination may be omitted from the plan if the Contractor has sufficient proof from previous operations as specified in 29 CFR 1926 (.62) (d)(3)(iii) and (iv) that workers will not be exposed over the action level. The Contractor shall substitute objective proof of action level compliance in Part A if "initial determination" monitoring is omitted. Part B: Continued Exposure Monitoring. Worker exposure monitoring after the initial lead exposure determination has been made.
- g. Work Practices Program describing the protective clothing to be used to protect workers from lead exposure, house keeping procedures employed to minimize spread on lead contamination in the lead hazard control area, hygiene facilities and practices used to prevent workers from inadvertent ingestion of lead.
- h. Administrative Control Procedures, to be used as a last resort, to limit worker exposure to lead. The worker rotation schedule to be employed, should engineering or personal protective equipment precautions fail to be effective, shall be described. This element of the plan shall be omitted if administrative controls will not be used.
- i. Medical Surveillance practices and procedures used to monitor worker exposure to lead and to assure fitness for wearing respiratory protection devices.
- j. Worker training meeting the requirements of 29 CFR 1926 Sections (.62) and (.59) to assure workers understand hazard associated with working with lead and how to protect themselves.
- k. Security: Locked security area for each lead hazard control area. A log book shall be kept documenting entry into and out of the lead hazard control area. Entry into lead hazard control areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Persons entering control areas shall be trained, medically evaluated, and equipped with personal protective equipment required for the specific control area to be entered.

1.7.1.2 Activity Hazard Analyses Appendix

An Activity Hazard Analysis (AHA) shall be prepared for each work task data element specified on the individual work task data element sheets at the end of this section. The AHA shall be submitted to the Contracting Officer prior to beginning specified work. Format shall be in accordance with EM 385-1-1, figure 1-1. The AHA shall be continuously reviewed and modified, when appropriate, to address changing conditions or operations. Each accepted AHA shall be appended to and become part of the APP.

1.7.1.3 Clearance Plan Appendix

The Contractor shall develop a Clearance Plan describing practices and

procedures used to assure that lead hazard control activities are complete and that lead contamination within the lead hazard control area comply with final clearance levels or visual clearance criteria. Sampling and analysis procedures used to document project completion and clearance goals shall be explained in the Clearance Plan Appendix.

1.8 PRE-CONSTRUCTION SAFETY CONFERENCE

1.8.1 Conference General Requirements

The Contractor and the QSHP shall attend a pre-construction safety conference prior to starting work. Items required to be submitted shall be reviewed for completeness, and where specified, for acceptance. Details of the APP shall be revised to correct any deficiencies, and resubmitted for acceptance. Onsite work shall not begin until the APP has been accepted, unless otherwise authorized by the Contracting Officer. One copy of the APP shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to personnel on the site. As work proceeds, the APP shall be adapted to new situations and conditions. Changes to the APP shall be made by the QSHP with acceptance by the Contracting Officer. Should an unforeseen hazard become evident during performance of the work, the QSHP shall inform the Contracting Officer, both verbally and in writing, for immediate resolution. In the interim, the QSHP shall take necessary action to re-establish and maintain safe working conditions; and to safeguard onsite personnel, visitors, the public, and the environment. Disregard for provisions of this specification, or the accepted APP, shall be cause for stopping of work until the matter is rectified.

1.8.2 Preparatory Inspection Meeting

The Contractor shall arrange and hold a preparatory inspection meeting to review completeness and adequacy of the APP immediately prior to beginning each phase of work.

1.9 MEDICAL SURVEILLANCE REQUIREMENTS

The Contractor shall comply with the following medical surveillance requirements:

- a. The Contractor shall make every attempt to keep occupational exposure to lead on this project below the action level of 30 micrograms/cubic meter defined in 29 CFR 1926 (.62). If it is not possible, and if occupational exposures could possibly exceed the action level for 30 or more days per year, the Contractor shall institute a medical surveillance program. The program shall meet the examination frequency and content requirements specified in paragraph (j)(1), (j)(2) and (j)(3) of 29 CFR 1926 (.62). Medical removal as specified in paragraph (k) of 29 CFR 1926 (.62), if necessary, shall be at the Contractor's expense.
- b. Medical surveillance and biological monitoring shall be in compliance with 29 CFR 1926 (.62) (g) and (j). Initial biological monitoring shall be performed on lead hazard control workers prior to assignment to the project. Workers shall not be assigned to the project if results indicate a need for restricted activities.
- c. All lead hazard control workers shall pass the medical examinations necessary to be approved by the occupational physician to wear

respiratory protection on this project. Occupational physician's approval shall be given prior to assignment to the project.

1.10 RESPIRATORY PROTECTION PROGRAM

The Contractor shall have a written respiratory protection program and shall be fully capable of implementing the requirement of the respiratory protection program on this project. The respiratory protection program shall meet the requirements of 29 CFR 1926 (.62) and 29 CFR 1910 (.134). Project specific respiratory protection requirements shall be included in the lead hazard control plan appendix of the Contractor's accident prevention plan.

1.11 LICENCES, PERMITS AND NOTIFICATIONS

The Contractor shall certify in writing to the Regional Office of the EPA, state's environmental protection agency responsible for lead hazard activities, and the Contracting Officer at least 20 days prior to the commencement of work that licenses, permits and notifications have been obtained. The Contractor is responsible for all associated fees or costs incurred in obtaining the licenses, permits and notifications.

1.12 TRAINING

1.12.1 OSHA Training Requirements

All Contractor personnel and/or subcontractors performing or responsible for onsite oversight of lead hazard control activities shall meet the following training requirements.

- a. Content of 29 CFR 1926 (.62) and its appendices.
- b. How operations could result in exposure over the action level.
- c. Purpose, selection, fitting, use and limitations of respirators.
- d. Purpose and description of the medical surveillance program.
- e. Use of engineering controls and good work practices to limit occupational exposure to lead.
- f. Implementation of the lead hazard control plan appendix of the accident prevention plan.
- g. Medical supervision for the use of chelating agents.
- h. Employee right of access to medical surveillance records as specified in 29 CFR 1910 (.20).

1.12.2 Qualified Safety and Health Professional

The qualified safety and health professional shall meet the training requirements in paragraph 1.12.1 and shall meet the training, experience and authority requirements in 29 CFR 1926 (.62) to be a competent person and be trained and have the experience and education to meet 40 CFR 745 Subpart L requirements to carry the following certifications:

- a. Certified Risk Assessor
- b. Certified Project Designer

c. Certified Supervisor

1.12.3 Independent Risk Assessor

The independent risk assessor shall meet the training requirements in paragraph OSHA Training Requirements, above, and shall meet the training and experience requirements in 40 CFR 745 to carry certification as a certified risk assessor.

1.12.4 Abatement Worker

Workers shall meet the OSHA Training Requirements specified above and the training requirements in 40 CFR 745 Subpart L to carry certification as a Certified Worker, if required.

1.12.5 Training Program Certification

Training to meet 40 CFR 745 Subpart L requirements shall be provided by an EPA accredited training provider and the Contractor shall provide proof in the Qualifications and Organization Report showing that personnel have passed certification examinations for their respective disciplines, that fees for certification have been paid to the EPA (or to the state for state-run programs) and that EPA has certified the QSHP, independent risk assessor, certified workers to perform their duties.

1.13 SAMPLING AND ANALYSIS

1.13.1 Sampling and Analytical Procedures

1.13.1.1 Sampling and Analysis Methods

Analysis shall conform to NIOSH Pub No. 84-100 Method 7082, Lead, for personal sampling required by 29 CFR 1926 (.62) ASTM E 1613. Sampling shall conform to ASTM E 1553 ASTM E 1741.

1.13.1.2 Paint Chip Sampling and Analysis

Sampling shall conform to ASTM E 1729 . Analysis shall conform to ASTM E 1613.

1.13.1.3 Dust Wipe Materials, Sampling and Analysis

Sampling shall conform to ASTM E 1792 ASTM E 1728 ASTM E 1644 Analysis shall conform to ASTM E 1613.

1.13.2 Occupational Exposure Assessment

Sampling and analytical procedures to determine compliance with the occupational exposure monitoring requirement of this section shall be described in the lead hazard control plan appendix of the Contractor's accident prevention plan. Monitoring for the initial determination may be omitted if the Contractor has sufficient proof from previous operations as specified in 29 CFR 1926 (.62) (d)(3)(iii) and (iv) that workers will not be exposed over the action level. The following occupational exposure monitoring requirements apply and shall be implemented if the requirements of 29 CFR 1926 (.62)(d)(3) (iii) and (iv) cannot be demonstrated.

- a. During Initial Monitoring the Contractor shall representatively sample employees with the greatest potential for exposure to

aerosolized lead.

- b. Continued/Additional Monitoring shall meet applicable paragraphs in 29 CFR 1926 (.62)(d)(6), Frequency, after the initial determination has been made.

1.13.3 Lead Hazard Control Area/Containment Monitoring

The Contractor shall perform a visual inspection once per day outside the lead hazard control area to assure visual clearance criteria are maintained while lead hazard control activities are performed. The Contractor shall clean at its own expense, and to the Contracting Officer's satisfaction, all contaminated surfaces outside the lead hazard control area, if surfaces fail visual clearance criteria.

1.13.4 Clearance Monitoring

Sampling and analytical procedures to determine the clearance requirements of this section shall be described by the Contractor in the Clearance Plan Appendix of the Accident Prevention Plan.

1.13.5 Waste Disposal Sampling

The Contractor shall sample the waste streams for TCLP analysis to determine waste disposal requirements in accordance with and approved landfill requirements.

1.13.6 Analytical Results

The Contractor shall develop and maintain during the course of the project a log of analytical results generated by the above sampling requirements. The log shall clearly describe the reason for which the sample was taken (worker exposure, migration control, clearance) the analytical result for each sample and evaluate if the analytical result passed or failed the action levels. At a minimum, the Contractor shall include analytical results for samples required to be taken in paragraphs Occupational Exposure Assessment, Lead Hazard Control Area/Containment Monitoring, Occupancy During Work, and Clearance Monitoring specified above.

1.14 CLEARANCE REQUIREMENTS

The Contractor shall describe clearance requirements for this project in the Clearance Plan Appendix of the Accident Prevention Plan.

1.15 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The Contractor shall describe the PPE to be used to protect workers from lead hazards in the Lead Hazard Control Plan Appendix of the Accident Prevention Plan. The Contractor shall furnish, at no cost to the workers, clothing for protection from lead-contaminated dust and debris. An adequate supply of these items shall be available for worker and Government personnel use. Protective clothing shall include:

- a. Coveralls : Full-body moisture permeable (breathable) disposable coveralls shall be provided to lead hazard control workers.
- b. Boots: Boots and shoes shall be provided as required by EM 385-1-1 Section 05.A.08 for workers. Boot/shoe covers shall be provided to prevent contamination of boots and shoes.
- c. Hand Protection: Gloves, etc., shall be provided as required by EM 385-1-1 Section 05.A.10 for workers.
- d. Head Protection: Hard hats shall be provided as required by 29 CFR 1910 (.135) and EM 385-1-1 Section 05.D for workers and authorized visitors.
- e. Eye and Face Protection: Eye and face protection shall be provided as required by 29 CFR 1910 (.133) and EM 385-1-1 Section 05.B for workers and authorized visitors.
- f. Respirators: NIOSH certified air-purifying respirators or filtering face pieces shall be provided for use as respiratory protection for airborne lead and for other hazardous airborne contaminants that may be encountered; as determined by the on-site safety and health supervisor. At a minimum, respirators shall be furnished to each employee required to enter a lead hazard control area where an employee exposure assessment has not yet been performed, or where monitoring data establishes the need for respiratory protection, or if requested by the employee.
- g. Respirator Cartridges/Filtering Face Pieces: Respirator cartridges shall be changed out/filtering face pieces properly disposed of when they become sufficiently loaded with particulate matter that workers experience breathing resistance. Cartridges and filtering face pieces shall be N, R or P 100 rated to assure

sufficient protection from lead exposure.

1.16 HYGIENE FACILITIES

The Contractor shall describe the personal hygiene facilities to be used by the workers in the Lead Hazard Control Plan Appendix of the Accident Prevention Plan. The Contractor shall provide hygiene facilities for lead hazard control workers. Hygiene facilities shall consist of the following:

1.16.1 Hand Wash Stations

The Contractor shall provide hand washing facilities for use by lead hazard control workers. Hand washing facilities shall comply with the requirements in 29 CFR 1926 (.51) (f). Faces and hands shall be washed when leaving the lead hazard control area and after each work-shift if showers are not provided.

1.16.2 Change Area

The Contractor shall provide a change area to workers. The change area shall be equipped so that contaminated work clothing and street clothes shall be stored separately to prevent cross contamination.

1.16.3 Showers

Showers shall be provided if feasible and if worker exposures exceed the PEL. When provided, showers facilities shall meet the requirements of 29 CFR 1926 (.51) (f).

1.16.4 Eating Area

The Contractor shall set aside an area or provide a room for taking breaks and eating lunch. This area shall be kept as free as practicable from lead contamination. Workers shall be required to follow the procedures in 29 CFR 1926 (.62) (i)(4) when using the room.

1.17 POSTED WARNINGS AND NOTICES

The following regulations, warnings, and notices shall be posted at the worksite in accordance with 29 CFR 1926 (.62).

1.17.1 Regulations

At least two copies of 29 CFR 1926 (.62) shall be made available for use by either the Contracting Officer or affected workers; and for the purpose of providing required information and training to the workers involved in the project. One copy shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to workers on the site.

1.17.2 Warning Signs and Labels

Warning signs shall be posted in each lead hazard control area where worker exposure to lead is undetermined or where the exposures are above the permissible exposure limit as defined in 29 CFR 1926 (.62). Signs shall be located to allow personnel to read the signs and take necessary precautions before entering the lead hazard control area.

1.17.2.1 Warning Signs

Warning signs shall be in English and be of sufficient size to be clearly legible, and display the following:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

1.17.2.2 Warning Labels

Warning labels shall be affixed to all lead waste disposal containers used to hold materials, debris and other products contaminated with lead hazards; warning labels shall be in English and be of sufficient size to be clearly legible, and display the following:

CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY
BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN
ACCORDANCE WITH APPLICABLE FEDERAL, STATE OR LOCAL REGULATIONS.

1.17.3 Worker Information

Right-to-know notices shall be placed in clearly visible areas accessible to personnel on the site, to comply with Federal, state, and local regulations.

1.17.4 Air Monitoring Results

Air monitoring results shall be prepared so as to be easily understood by the workers. One copy shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to the workers as specified in 29 CFR 1926 (.62).

1.17.5 Emergency Telephone Numbers

A list of emergency telephone numbers shall be posted at the site. The list shall include numbers of the local hospital, emergency squad, police and fire departments, Government and Contractor representatives who can be reached 24 hours per day, and professional consultants directly involved in the project.

1.18 MATERIALS AND EQUIPMENT

Sufficient quantities of health and safety materials required by 29 CFR 1926 (.62), and other materials and equipment needed to complete the project, shall be available and kept on the site.

1.18.1 Abrasive Removal Equipment

The use of powered machine for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

1.18.2 Vacuum Systems

Vacuum systems shall be suitably sized for the project, and filters shall be capable of trapping and retaining all mono-disperse particles as small

as 0.3 micrometers at a minimum efficiency of 99.97 percent. Used filters that are being replaced shall be disposed in a proper manner.

1.18.3 Heat Blower Guns

If utilized, heat blower guns shall be flameless, electrical, paint-softener type with controls to limit temperature to 1,100 degrees F. Heat blower shall be DI (non-grounded) 120 volts ac, and shall be equipped with cone, fan, glass protector and spoon reflector nozzles.

1.18.4 Chemical Paint Strippers

If utilized, chemical paint strippers shall not contain methylene chloride and shall be formulated to prevent stain, discoloration, or raising of the substrate materials.

1.18.5 Chemical Paint Stripper Neutralizer

If utilized, neutralizers for paint strippers shall be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

1.18.6 Detergents and Cleaners

Detergents or cleaning agents used shall have demonstrated effectiveness in lead control work using cleaning techniques specified by HUD 6780 guidelines.

1.19 EXPENDABLE SUPPLIES

1.19.1 Polyethylene Bags

Disposable bags shall be polyethylene plastic and shall be a minimum of 6 mils thick (4 mils thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be capable of being made leak-tight. Leak-tight means that solids, liquids or dust cannot escape or spill out.

1.19.2 Polyethylene Leak-tight Wrapping

Wrapping used to wrap lead contaminated debris shall be polyethylene plastic that is a minimum of 6 mils thick or any other thick plastic material shown to demonstrate at least equivalent performance.

1.19.3 Polyethylene Sheeting

Sheeting shall be polyethylene plastic with a minimum thickness of 6 mil, or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, flame-resistant polyethylene sheets which conform to the requirements of NFPA 701 shall be provided.

1.19.4 Tape and Adhesive Spray

Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces.

After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water. Tape shall be minimum 2 inches wide, industrial strength.

1.19.5 Containers

When used, containers shall be leak-tight and shall be labeled in accordance with EPA, DOT and OSHA standards, as specified in paragraph WARNING LABELS.

1.19.6 Chemicals

Chemicals, including caustics and paint strippers, shall be properly labeled, used in accordance with the manufacturers recommendations and stored in leak-tight containers. Material Safety Data Sheets (MSDSs) shall be provided and hazard communication procedures implemented in conformance with paragraph HAZARD COMMUNICATION PROGRAM.

1.20 STORAGE OF MATERIALS

Materials shall be stored protected from damage and contamination. During periods of cold weather, plastic materials shall be protected from the cold. Flammable or hazardous materials shall not be stored inside a building. Materials shall be regularly inspected to identify damaged or deteriorating items. Damaged or deteriorated items shall not be used and shall be removed from the site as soon as they are discovered. Stored materials shall not present a hazard or an inconvenience to workers, visitors, and/or other occupants and employees of the facility in which they are located.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 WORK PROCEDURES

The Contractor shall perform work following practices and procedures described accident prevention plan.

3.1.1 Lead Hazard Control Areas, Equipment and Procedures

The Contractor shall set up lead hazard control areas and operate equipment within the lead hazard control area in a manner that will minimize migration of lead dust beyond the lead hazard control area boundaries and minimize exposure to workers.

3.1.2 Lead Hazard Control Areas

Access into lead hazard control areas by the general public shall be prohibited. Workers entering the lead hazard control area shall meet medical surveillance requirements of this contract and shall be required to understand and follow procedures described in the Contractor's accident prevention plan for reducing lead exposure.

3.2 USE OF HYGIENE FACILITIES

- a. Personnel and equipment shall be decontaminated when exiting the

lead hazard control area. The Contractor shall comply with the following personnel and equipment decontamination procedures:

- (1) HEPA vacuum outer garments and equipment.
 - (2) Wet Wipe Equipment.
 - (3) Remove outer layer of garments.
 - (4) Thoroughly wash face and hands, if showering not required.
 - (5) Shower (if applicable).
 - (6) Remove Respirator (if applicable).
 - (7) Exit lead hazard control area.
- b. The Contractor shall provide, and workers shall use, a change room to change into work clothing at the beginning of a work shift. At the end of the work shift workers shall change back into street clothing and leave contaminated work clothing at the site for disposal or laundering.
- c. The Contractor shall provide an eating facility as free as practical from lead contamination. Workers shall be allowed usage of the eating facility for rest/lunch breaks.

3.3 FURNISHINGS

The tenants shall remove furniture and equipment from the housing units before lead hazard control work begins.

3.4 WASTE DISPOSAL PROCEDURES

3.4.1 Waste Stream Classification

The Contractor shall determine the RCRA waste classification for all waste streams generated by the lead hazard control project. The Contractor shall perform the sampling and analysis specified in paragraph WASTE DISPOSAL, evaluate analytical results and propose waste stream treatment and disposal requirements for the contract. The Contracting Officer will approve waste stream treatment and disposal requirements proposed by the Contractor.

3.4.2 Hazardous Waste Transportation and Disposal

The Contractor shall transport, treat and dispose of hazardous waste in accordance with the requirements of Section 02120A TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

3.5 LEAD HAZARD CONTROL PROCEDURES, METHODS AND TECHNIQUES.

3.5.1 Paint Removal Methods

Prohibited paint removal methods shall include: open flame burning or torching, including the use of heat guns having operating temperatures greater than 1,100 degrees F; machine sanding or grinding without HEPA exhaust; non-contained hydro blasting or high-pressure water wash; abrasive blasting or sandblasting without HEPA exhaust; dry scraping, except near electrical outlets or when using a heat gun. Chemical paint removers containing methylene chloride are prohibited. Building components and structures adjacent to the removal process shall be appropriately protected from damage due to the removal process employed. Stripping shall be done according to manufacturer's recommendations. Stripped substrates shall be thoroughly washed and neutralized before applying a primer or sealing coat.

3.5.1.1 Low Temperature Heat Gun

If heat guns are utilized, the following shall be performed. Prior to beginning work, electrical fuses and adequate electrical supply shall be verified. Only fuses properly sized for the service, and otherwise permitted by code, shall be used. Properly sized fuses shall not be changed out with larger fuses to increase amperage beyond safe limits. Portable electric generators may be used to safely supply adequate amperage. An accessible garden hose with a pressure-release spray nozzle; a crowbar to remove smoldering wood; and a long-handled sledgehammer to open up walls exposed to smoldering insulation shall be readily available. A fully charged ABC-type (20 pound minimum) fire extinguisher shall be available within 100 feet of the work area. Adequate ventilation shall be provided for the work area. Worker protection shall include respirators equipped with combination HEPA filter/organic vapor cartridges. The Contractor shall equip heat guns with extension tubes or wire mesh as needed to prevent premature burnout of the heating elements and to minimize paint film scorching or smoking. Optimal heat gun/substrate separation is typically 3 to 6 inches.

3.5.1.2 HEPA Sanding

If HEPA sanding will be performed, the following shall be performed. The HEPA vacuum shall be correctly sized to provide adequate airflow, permitting the system to operate properly. If longer exhaust hoses are used, a larger HEPA vacuum shall be provided to handle the extra pressure drop in the vacuum hose. The HEPA filter shall be operated in accordance with manufacturer's instructions. Worker protection shall include respirators or filtering facepieces equipped with HEPA filters.

3.5.1.3 Wet Scraping

If wet scraping will be performed, the following shall be performed. Surfaces near electrical outlets shall not be moistened but shall be dry scraped only. Loose material shall be scraped from the surface and deposited onto the containment plastic. Damp scrapings shall be cleaned up as soon as possible to prevent tracking throughout the work area. Scraper blades shall be kept sharp. Additional scraper blades shall be supplied and shall be selected for the type of surface being scraped.

3.5.1.4 HEPA Vacuum Blasting

If HEPA vacuum blasting will be performed, the following shall be performed. The blast head shall be shrouded under a vacuum and exhaust passed through a HEPA filter. The blast head shall remain in continuous contact with the surface to avoid dispersal of both the blast medium and particulate. Work shall be positioned to minimize the degree workers must reach above shoulder level, in order to minimize worker fatigue and loss of blast head contact with the surface.

3.5.1.5 HEPA Vacuum Needle Gun

If needle guns will be utilized, the following shall be performed. The vacuum needle gun head shall be equipped with a vacuum shroud designed for the surface to be treated. The needle gun shall be operated to maximize surface contact of the vacuum shroud. Work shall be positioned to minimize the degree workers must reach above shoulder level, in order to minimize worker fatigue and loss of needle gun contact with the surface.

3.5.1.6 Offsite Paint Removal

Building components to be stripped shall be removed using removal techniques that minimize the amount of airborne dust generated. The painted seams between walls and the components shall be cut with a utility razor knife to minimize wall damage. If more than one component is to be removed and stripped, the labeling of each component for eventual reinstallation shall utilize a punch system. The identifying punches shall be made in an obscure location on the component. Once removed, the component shall be wrapped and sealed as specified for transport. Stripped components shall be thoroughly washed and neutralized after stripping. Stripped components shall be restored to structural soundness after stripping, if necessary; and shall be cleaned using standard HEPA vacuum/wet wash/HEPA vacuum cycle, dried, and pH neutralized before repainting.

3.5.1.7 Onsite Paint Removal

Paint remover shall be applied in accordance with the manufacturer's instructions. Outdoor application shall only be performed in weather conditions recommended by the manufacturer. The work area surrounding the application process shall be secured to prevent access by children and unauthorized personnel. Workers shall be provided with the appropriate personal protective clothing and equipment in accordance with manufacturer's recommendations and good industrial hygiene practice. A portable eyewash shall be provided whenever eye irritant strippers are used. An abundant source of running water shall be provided in the work area. The stripper shall be tested in a small area prior to full scale stripping. Caustic strippers shall not be used on aluminum or glass surfaces. Waste disposal shall be in accordance with paragraph WASTE DISPOSAL PROCEDURES. Stripped surfaces shall be neutralized and washed in accordance with manufacturer's instructions and paragraph CHEMICAL PAINT STRIPPER NEUTRALIZER. Stripped surfaces shall be completely dry before repainting, and shall be repainted only with paints proven compatible with the stripping techniques employed.

3.6 CLEARANCE PROCEDURES

3.6.1 Visual Inspection

QSHP shall perform a visual inspection, using the form at the end of this section, for each lead hazard control area to assure that lead hazard control activities, identified in the individual work task data elements, have been properly completed. The QSHP shall visually verify that lead hazards have been removed, control technology has been appropriately applied/installed and that the lead hazard control area is free of dust and paint chips generated by lead hazard control activities.

3.6.2 Analytical Demonstration of Clearance

After the visual inspection the QSHP independent risk assessor shall take clearance samples for laboratory analysis to verify clearance requirements specified in paragraph CLEARANCE REQUIREMENTS have been met.

3.7 EVALUATION OF SAMPLING AND MONITORING RESULTS

Analytical results from samples taken during lead hazard control activities shall be evaluated to determine compliance with occupational safety and health standards and project specific control efficiency and

clearance/clean up levels.

3.7.1 Occupational Safety and Health

The QSHP shall review the analytical results from samples taken for the initial exposure assessment and continued occupational safety and health monitoring if required. Effectiveness and adequacy of personal protective equipment, respirators, work practices, hygiene facilities and personal decontamination procedures shall be evaluated and upgrades/downgrades in equipment and procedures made. After notifying the Contracting Officer the following shall be applied:

- a. Exposures over the PEL (0.05 mg/cubic meter):
 - (1) Improve work practices to reduce exposures.
 - (2) Don respirators.
 - (3) Assure eating facilities and change rooms are clean and are free from settled dust.
 - (4) Shower as part of personal decontamination.
- b. Exposures over the Action Level (0.03 mg/cubic meter):
 - (1) Assure exposed individuals enrolled in the medical surveillance program.
 - (2) Assure exposed individuals enrolled in and up to date with lead exposure training requirements.

3.7.2 Control Efficiency of Containment Features

The QSHP shall review and document results of the visual inspection determining visual clearance criteria are being met while lead hazard control activities are being performed. The QSHP shall review analytical results from samples taken to determine if lead is migrating outside lead hazard control areas at levels in excess of clearance criteria. The QSHP shall notify the Contracting Officer and apply the following actions if results exceed project specific clearance levels outside the lead hazard control area:

- a. Require/improve containment.
- b. Improve work practices to reduce lead aerosol generation.

3.7.3 Clearance

The QSHP shall review analytical results for the samples taken to determine compliance with project specific clearance requirements. The following actions apply and shall be performed at the Contractor's expense if project specific clearance levels are exceeded:

- Reclean surfaces.
- Retest to determine clearance.

3.7.4 Removal of Lead Hazard Control Area

Upon acceptance of the final clearance certification by the Contracting

Officer, and when authorized, cleared Lead Hazard Control Area boundary controls and warning signs shall be removed.

3.8 CLEARANCE REPORT

The QSHP shall prepare a clearance report including the following information:

- a. Start and completion dates of lead hazard control activities.
- b. Type of lead hazard control activity performed (i.e., abatement, interim control, renovation, remodeling), locations and lead hazards controlled or abated.
- c. The name and address of each firm conducting lead hazard control activities and the name of each supervisor assigned to the project.
- d. The Occupant Protection Plan prepared pursuant to paragraph OCCUPANT PROTECTION PLAN.
- e. The name, address and signature of the QSHP or independent risk assessor to indicate clearance requirements have been met.
- f. Certification of each Final Cleaning and Visual Inspection performed by the QSHP.
- g. Analytical results from clearance sampling performed by the QSHP or independent risk assessor, the name of the laboratory that conducted the analysis. Results shall be provided in both the laboratory report and on the appropriate example forms provided at the end of this section.
- h. A detailed written description of the lead hazard control activities performed, including hazard control methods used, locations of rooms and/or components where lead hazard control activities occurred, reason for selecting particular hazard control methods for each component, and any suggested monitoring of encapsulants or enclosures.
- i. Hazardous waste disposal documentation.
- j. Contractor provided installation/maintenance manuals.

3.9 TITLE TO MATERIALS

Materials resulting from demolition work, except as specified otherwise, shall be come the property of the Contractor, and shall be disposed of in accordance with Section 02220A DEMOLITION, except as specified.

3.10 PAYMENT FOR HAZARDOUS WASTE

Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Government.

3.11 CERTIFICATION OF VISUAL INSPECTION

Certify that the lead hazard control area(s) for each individual work task

data elements have passed visual clearance criteria and are ready for clearance sampling. To pass visual clearance, lead hazards have to be removed; control technology appropriately applied/installed; the lead hazard control area must be free from visible dust debris, paint chips or any other residue that may have been generated by the lead hazard control activities.

Signature by the QSHP indicates that the described lead hazard control area(s) have passed visual clearance criteria. Provide detailed description of each Lead Hazard Control Area.

BY: _____
QSHP Date

Print name and title _____

CONTRACTING OFFICER ACCEPTANCE OR REJECTION

The Contracting Officer hereby determines that the Contractor has performed visual inspection of the lead hazard control area and by quality assurance inspection, finds the Contractor's work to be:

_____ Acceptable, ready for performance of clearance sampling

_____ Unacceptable, Contractor instructed to re-clean the lead hazard control area

BY: Contracting Officer's Representative

Signature _____ Date

Print name and title _____

Lead Hazard Control Clearance Sampling Certification Form

Date _____

Name of QSHP or Certified Risk Assessor _____

License No. _____

Work Task Data Element _____

Clearance Levels _____

40 CFR 745 Clearance Levels

24 CFR 35 Clearance Levels

Sample quantity and location:

Windows _____

Floors _____

Exterior Soils _____

Date of sample collection _____ Date Shipped to lab _____

Shipped by _____
Signature

I certify that the clearance samples taken meet the clearance sampling requirements of this contract.

By: _____ Date: _____
QSHP or independent risk assessor

Print name and Title: _____

CONTRACTING OFFICER ACCEPTANCE OR REJECTION

I have inspected sampling locations and procedures and have found them to be
_____ Acceptable, meet contract requirements.

_____ Unacceptable, do not meet contract requirements, Contractor is directed to resample.

By: Contracting Officer's Representative

Signature _____ Date _____

Print Name and Title _____

INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet _____ of _____

There is a separate data sheet for each individual work task.

WORK TASK DESIGNATION NUMBER: _____

2. LOCATION OF WORK TASK:

3. BRIEF DESCRIPTION OF THE LEAD HAZARD CONTROL ACTIVITY:

4. POST LEAD HAZARD CONTROL BUILDING/FACILITY USE: COMMERCIAL/PUBLIC

5. LEAD CONTAMINATED DEBRIS DISPOSAL DESTINATION:

6. CLEARANCE REQUIREMENTS: 40 CFR 745 24 CFR 35 VISUAL

-- End of Section --

SECTION 15080A

THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. At the discretion of the Government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 580/A 580M	(1998) Stainless Steel Wire
ASTM B 209	(2000) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 1126	(1998) Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation
ASTM C 1136	(1995) Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C 1290	(1995) Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts
ASTM C 195	(1995) Mineral Fiber Thermal Insulating Cement
ASTM C 449/C 449M	(1995) Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
ASTM C 534	(1999) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C 547	(1995) Mineral Fiber Pipe Insulation
ASTM C 552	(2000) Cellular Glass Thermal Insulation
ASTM C 553	(1999) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 591	(1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

ASTM C 612	(2000) Mineral Fiber Block and Board Thermal Insulation
ASTM C 647	(1995) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM C 665	(1998) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C 795	(1992; R 1998e1) Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C 920	(1998) Elastomeric Joint Sealants
ASTM C 921	(1989; R 1996) Determining the Properties of Jacketing Materials for Thermal Insulation
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM E 96	(2000) Water Vapor Transmission of Materials

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-69	(1996) Pipe Hangers and Supports - Selection and Application
-----------	--

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA Insulation Stds	(1993) National Commercial & Industrial Insulation Standards
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1.2 SYSTEM DESCRIPTION

Field-applied insulation and accessories on mechanical systems shall be as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated.

1.3 GENERAL QUALITY CONTROL

1.3.1 Standard Products

Materials shall be the standard products of manufacturers regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.3.2 Installer's Qualifications

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.3.3 Surface Burning Characteristics

Unless otherwise specified, insulation not covered with a jacket shall have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Insulation systems which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Insulation materials located exterior to the building perimeter are not required to be fire-rated. Flame spread and smoke developed indexes shall be determined by ASTM E 84. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E 84.

1.3.4 Identification of Materials

Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Samples

Thermal Insulation Materials;

A complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories for each mechanical system requiring insulation shall be included. Materials furnished under this section of the specification shall be submitted at one time.

1.5 STORAGE

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. Insulation material and supplies that become dirty, dusty, wet, or otherwise contaminated may be rejected by the Contracting Officer.

PART 2 PRODUCTS

2.1 GENERAL MATERIALS

Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either the wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C 795 requirements. Materials shall be asbestos free and conform to the following:

2.1.1 Adhesives

2.1.1.1 Mineral Fiber Insulation Cement

Cement shall be in accordance with ASTM C 195.

2.1.1.2 Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. Lagging adhesives shall be nonflammable and fire-resistant and shall have a flame spread rating no higher than 25 and a smoke developed rating no higher than 50 when tested in accordance with ASTM E 84. Adhesive shall be pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bounding fibrous glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations.

2.1.2 Contact Adhesive

Adhesive may be dispersed in a nonhalogenated organic solvent or, dispersed in a nonflammable organic solvent which shall not have a fire point below 200 degrees F. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 212 degrees F. The adhesive shall be nonflammable and fire resistant.

2.1.3 Caulking

ASTM C 920, Type S, Grade NS, Class 25, Use A.

2.1.4 Corner Angles

Nominal 0.016 inch aluminum 1 x 1 inch with factory applied kraft backing. Aluminum shall be ASTM B 209, Alloy 3003, 3105, or 5005.

2.1.5 Finishing Cement

Mineral fiber hydraulic-setting thermal insulating cement ASTM C 449/C 449M.

2.1.6 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth and glass tape shall have flame spread and smoke developed ratings of no greater than 25/50 when measured in accordance with ASTM E 84. Tape shall be 4 inch wide rolls.

2.1.7 Staples

Outward clinching type ASTM A 167, Type 304 or 316 stainless steel..

2.1.8 Jackets

ASTM C 921, Type I, maximum moisture vapor transmission 0.02 perms, (measured before factory application or installation), minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork, where a minimum puncture resistance of 25 Beach units is acceptable. Minimum tensile strength, 35 pound/inch width. ASTM C 921, Type II, minimum puncture resistance 25 Beach units, tensile strength minimum 20 pound/inch width. Jackets used on insulation exposed in finished areas shall have white finish suitable for painting without sizing. Based on the application, insulation materials which require factory applied jackets are mineral fiber, cellular glass, and phenolic foam. All non-metallic jackets shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84.

2.1.8.1 White Vapor Retarder All Service Jacket (ASJ)

For use on hot/cold pipes, ducts, or equipment vapor retarder jackets used on insulation exposed in finished areas shall have white finish suitable for painting without sizing.

2.1.8.2 Aluminum Jackets

Aluminum jackets shall be corrugated, embossed or smooth sheet, 0.016 inch nominal thickness; ASTM B 209, Temper H14, Temper H16, Alloy 3003, 5005, or 3105 with factory applied moisture retarder. Corrugated aluminum jacket shall not be used outdoors. Aluminum jacket securing bands shall be Type 304 stainless steel, 0.015 inch thick, 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inch and larger diameter. Aluminum jacket circumferential seam bands shall be 2 x 0.016 inch aluminum matching jacket material. Bands for insulation below ground shall be 3/4 x 0.020 inch thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburgh or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints shall be designed by the manufacturer to seal the joints and hold the jacket in place.

2.1.8.3 Polyvinyl Chloride (PVC) Jackets

Polyvinyl chloride (PVC) jacket and fitting covers shall have high impact strength, UV resistant rating or treatment and moderate chemical resistance with minimum thickness 0.030 inch.

2.1.9 Vapor Retarder Coating

The vapor retarder coating shall be fire and water resistant and appropriately selected for either outdoor or indoor service. Color shall be white. The water vapor permeance of the compound shall be determined according to procedure B of ASTM E 96 utilizing apparatus described in ASTM E 96. The coating shall be a nonflammable, fire resistant type. All other application and service properties shall be in accordance with ASTM C 647.

2.1.10 Wire

Soft annealed ASTM A 580/A 580M Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

2.2 PIPE INSULATION MATERIALS

Pipe insulation materials shall meet the following requirements:

2.2.1 Aboveground Cold Pipeline

Insulation for minus 30 degrees to plus 60 degrees F shall be as follows:

- a. Cellular Glass: ASTM C 552, Type II, and Type III. Supply the insulation with manufacturer's recommended factory applied jacket.
- b. Flexible Elastomeric Cellular Insulation: ASTM C 534, Type I
- c. Phenolic Insulation: ASTM C 1126, Type III. Phenolic insulations shall comply with ASTM C 795 and with the ASTM C 665 paragraph Corrosiveness. Supply the insulation with manufacturer's recommended factory applied jacket.
- d. Mineral Fiber: ASTM C 547
- e. Polyisocyanurate Insulation: ASTM C 591, type I. Supply the insulation with manufacturer's recommended factory applied jacket.

2.2.2 Aboveground Hot Pipeline

Insulation for above 60 degrees F shall be as follows

- a. Mineral Fiber: ASTM C 547, Types I, II or III, supply the insulation with manufacturers recommended factory applied jacket.
- c. Cellular Glass: ASTM C 552, Type II and Type III. Supply the insulation with manufacturers recommended factory applied jacket.
- d. Flexible Elastomeric Cellular Insulation: ASTM C 534, Type I or II to 200 degrees F service.
- e. Phenolic Insulation: ASTM C 1126 Type III to 250 F service shall comply with ASTM C 795. Supply the insulation with manufacturers recommended factory applied jacket.
- g. Polyisocyanurate Insulation: ASTM C 591, Type 1, to 300 degrees F service. Supply the insulation with manufacturer's recommended factory applied jacket.

2.3 DUCT INSULATION MATERIALS

Duct insulation materials shall be as follows:

2.3.1 Rigid Mineral Fiber

ASTM C 612, Type IA, IB, II, III, & IV.

2.3.2 Flexible Mineral Fiber

ASTM C 553, Type I, or Type II up to 250 F. ASTM C 1290 Type III.

2.3.3 Cellular Glass

ASTM C 552, Type I.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the jobsite. Joints shall be staggered on multi layer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with MICA Insulation Stds standard plates except where modified herein or on the drawings.

3.1.2 Firestopping

Where pipes and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials as specified in Section 07840A FIRESTOPPING.

3.1.3 Painting and Finishing

Painting shall be as specified in Section 09900 PAINTING, GENERAL.

3.1.4 Installation of Flexible Elastomeric Cellular Insulation

Flexible elastomeric cellular insulation shall be installed with seams and joints sealed with rubberized contact adhesive. Insulation with pre-applied adhesive is not permitted. Flexible elastomeric cellular insulation shall not be used on surfaces greater than 200 degrees F. Seams shall be staggered when applying multiple layers of insulation. Insulation exposed to weather and not shown to have jacketing shall be protected with two coats of UV resistant finish as recommended by the manufacturer after the adhesive is dry. A brush coating of adhesive shall be applied to both butt ends to be joined and to both slit surfaces to be sealed. The adhesive shall be allowed to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints shall not be capable of being pulled apart one hour after application. Insulation that can be pulled apart one hour after installation shall be replaced.

3.1.5 Welding

No welding shall be done on piping, duct or equipment without written approval of the Contracting Officer. The capacitor discharge welding process may be used for securing metal fasteners to duct.

3.2 PIPE INSULATION INSTALLATION

3.2.1 Pipe Insulation

3.2.1.1 General

Pipe insulation shall be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder, including straight runs, fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used. Pipe insulation shall be omitted on the following:

- b. Chromium plated pipe to plumbing fixtures. However, fixtures for use by the physically handicapped shall have the hot water supply and drain, including the trap, insulated where exposed.
- c. Sanitary drain lines.

3.2.1.2 Pipes Passing Through Walls, Roofs, and Floors

- a. Pipe insulation shall be continuous through the sleeve.
- b. An aluminum jacket with factory applied moisture retarder shall be provided over the insulation wherever penetrations require sealing.
- c. Where penetrating interior walls, the aluminum jacket shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.
- d. Where penetrating floors, the aluminum jacket shall extend from a point below the backup material to a point 10 inches above the floor with one band at the floor and one not more than 1 inch from the end of the aluminum jacket.
- e. Where penetrating waterproofed floors, the aluminum jacket shall extend from below the backup material to a point 2 inches above the flashing with a band 1 inch from the end of the aluminum jacket.
- f. Where penetrating exterior walls, the aluminum jacket required for pipe exposed to weather shall continue through the sleeve to a point 2 inches beyond the interior surface of the wall.
- h. For hot water pipes supplying lavatories or other similar heated service which requires insulation, the insulation shall be terminated on the backside of the finished wall. The insulation termination shall be protected with two coats of vapor barrier coating with a minimum total thickness of 1/16 inch applied with glass tape embedded between coats (if applicable). The coating shall extend out onto the insulation 2 inches and shall seal the end of the insulation. Glass tape seams shall overlap 1 inch. Caulk the annular space between the pipe and wall penetration with approved fire stop material. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration at least 3/8 inch.
- i. For domestic cold water pipes supplying lavatories or other similar cooling service which requires insulation, the insulation shall be

terminated on the finished side of the wall (i.e., insulation must cover the pipe throughout the wall penetration). The insulation shall be protected with two coats of vapor barrier coating with a minimum total thickness of 1/16 inch. The coating shall extend out onto the insulation 2 inches and shall seal the end of the insulation. Caulk the annular space between the outer surface of the pipe insulation and the wall penetration with an approved fire stop material having vapor retarder properties. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration by at least 3/8 inch.

3.2.1.3 Pipes Passing Through Hangers

- a. Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 2 inches and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-69. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches shall be installed.
- d. Vertical pipes shall be supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-69 covering the 360 degree arc of the insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The vertical weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe shall be additionally supported with hangers in the vertical run of the pipe which are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.
- e. Inserts shall be covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, shall overlap the adjoining pipe jacket 1-1/2 inches, and shall be sealed as required for the pipe jacket. The jacket material used to cover inserts in flexible elastomeric cellular insulation shall conform to ASTM C 1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.1.4 Flexible Elastomeric Cellular Pipe Insulation

Flexible elastomeric cellular pipe insulation shall be tubular form for pipe sizes 6 inches and less. Seams shall be staggered when applying multiple layers of insulation. Sweat fittings shall be insulated with

miter-cut pieces the same size as on adjacent piping. Screwed fittings shall be insulated with sleeved fitting covers fabricated from miter-cut pieces and shall be overlapped and sealed to the adjacent pipe insulation.

3.2.2 Aboveground Cold Pipelines

The following cold pipelines shall be insulated per Table I minus 30 degrees to plus 60 degrees F:

- a. Domestic cold.
- d. Refrigerant suction lines and exterior liquid lines..
- g. Air conditioner condensate drains.
- i. Exposed lavatory drains and domestic water lines serving plumbing fixtures for handicap persons.

3.2.2.1 Insulation Thickness

Insulation thickness shall be as indicated in Table I.

Table I - Cold Piping Insulation Thickness
Pipe Size (inches)

Type of Service	Material	Runouts up to 2 in*	1 in & less	1.25 - 2 in
Refrigerant suction piping	CG		1.5	
	FC		1.0	1.0
	PF		1.5	1.5
	PC		1.0	1.0
Cold domestic water, above and below ceilings	CG	1.5	1.5	1.5
	FC	3/8	3/8	3/8
	PF	1.5	1.5	1.5
	PC	1.0	1.0	1.0
Exposed lavatory drains and domestic water lines serving plumbing fixtures for handicap personnel	FC	0.5	0.5	0.5
	MF	0.5	1.0	1.0
Air conditioning condensate drain located inside building	FC		3/8	
	PF		1.5	
	PC		1.0	

*When runouts to terminal units exceed 12 feet, the entire length of runout shall be insulated like main feed pipe.

Table I - Cold Piping Insulation Thickness
Pipe Size (inches)

Type of Service	Material	Runouts up to 2 in*	1 in	1.25 -
			& less	2 in

LEGEND:

PF - Phenolic Foam
CG - Cellular Glass
MF - Mineral Fiber
FC - Flexible Elastomeric Cellular
PC - Polyisocyanurate Foam

3.2.2.2 Jacket for Mineral Fiber, Cellular Glass, Phenolic Foam, and Polyisocyanurate Foam Insulated Pipe

Insulation shall be covered with a factory applied vapor retarder jacket or field applied seal welded PVC jacket. Insulation inside the building shown to be protected with an aluminum jacket shall have the insulation and vapor retarder jacket installed as specified herein. The aluminum jacket shall be installed as specified for piping exposed to weather, except sealing of the laps of the aluminum jacket is not required.

3.2.2.3 Insulation for Straight Runs (Mineral Fiber, Cellular Glass, Phenolic Foam and Polyisocyanurate Foam)

- a. Insulation shall be applied to the pipe with joints tightly butted. All butted joints and ends shall be sealed with a vapor retarder coating.
- b. Longitudinal laps of the jacket material shall overlap not less than 1-1/2 inches. Butt strips 3 inches wide shall be provided for circumferential joints.
- c. Laps and butt strips shall be secured with adhesive and stapled on 4 inch centers if not factory self-sealing. If staples are used, they shall be sealed per paragraph 3.2.2.3 e.
- d. Factory self-sealing lap systems may be used when the ambient temperature is between 40 degrees and 120 degrees F during installation. The lap system shall be installed in accordance with manufacturer's recommendations. Stapler shall be used only if specifically recommended by the manufacturer. Where gaps occur, the section shall be replaced or the gap repaired by applying adhesive under the lap and then stapling.
- e. All Staples, including those used to repair factory self-seal lap systems, shall be coated with a vapor retarder coating. All seams, except those on factory self-seal systems shall be coated with vapor retarder coating.
- f. Breaks and punctures in the jacket material shall be patched by wrapping a strip of jacket material around the pipe and securing it with adhesive, stapling, and coating with vapor retarder coating. The patch shall extend not less than 1-1/2 inches past the break.

- g. At penetrations such as thermometers, the voids in the insulation shall be filled and sealed with vapor retarder coating.

3.2.2.4 Insulation for Fittings and Accessories

- a. Pipe insulation shall be tightly butted to the insulation of the fittings and accessories. The butted joints and ends shall be coated with vapor retarder coating.
- b. Precut or preformed insulation shall be placed around all fittings and accessories and shall conform to MICA plates except as modified herein: 5 for anchors; 10, 11, and 13 for fittings; 14 for valves; and 17 for flanges and unions. Insulation shall be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow".
- c. Upon completion of insulation installation on flanges, unions, valves, anchors, fittings and accessories, terminations, seams, joints and insulation not protected by factory vapor retarder jackets or PVC fitting covers shall be protected with two coats of vapor retarder coating with a minimum total thickness of 1/16 inch, applied with glass tape embedded between coats. Tape seams shall overlap 1 inch. The coating shall extend out onto the adjoining pipe insulation 2 inches. Fabricated insulation with a factory vapor retarder jacket shall be protected with two coats of vapor retarder coating with a minimum thickness of 1/16 inch and with a 2 inch wide glass tape embedded between coats. Where fitting insulation butts to pipe insulation, the joints shall be sealed with a vapor retarder coating and a 4 inch wide ASJ tape which matches the jacket of the pipe insulation.
- d. Anchors attached directly to the pipe shall be insulated for a sufficient distance to prevent condensation but not less than 6 inches from the insulation surface.
- e. Insulation shall be marked showing the location of unions, strainers, and check valves.

3.2.2.5 Optional PVC Fitting Covers

At the option of the Contractor, premolded, one or two piece PVC fitting covers may be used in lieu of the vapor retarder and embedded glass tape. Factory precut or premolded insulation segments shall be used under the fitting covers for elbows. Insulation segments shall be the same insulation as the pipe insulation including same density, thickness, and thermal conductivity. The covers shall be secured by PVC vapor retarder tape, adhesive, seal-welding or with tacks made for securing PVC covers. Seams in the cover, and tacks and laps to adjoining pipe insulation jacket, shall be sealed with vapor retarder tape to ensure that the assembly has a continuous vapor seal. Factory or field cut blanket insulation shall not be used on pipe below 60 degrees F.

3.2.3 Aboveground Hot Pipelines

The following hot pipelines above 60 degrees F shall be insulated per Table II:

- a. Domestic hot water supply.
- b. Steam.

3.2.3.1 Insulation Thickness

Insulation thickness for hot pipelines shall be determined using Table II.

LEGEND:

PF - Phenolic Foam
CG - Cellular Glass

MF - Mineral Fiber
FC - Flexible Elastomeric Cellular

PC - Polyisocyanurate Foam

Table II - Hot Piping Insulation Thickness
Pipe Size (inches)

Type of Service (degrees F)	Material	Runouts up to 2 in *	1 in & less	1.25 - 2 in
Hot domestic water	CG	1.5	1.5	1.5
FC	0.5	0.5	1.0	
MF	0.5	1.5	1.5	1.5

* When runouts to terminal units exceed 12 feet, the entire length of runout shall be insulated like the main feed pipe.

** Applies to recirculating sections of service or domestic hot water systems and first 8 feet from storagetank for non-recirculating systems.

3.2.3.2 Jacket for Insulated Hot Pipe, Except Pipe Insulated with Flexible Elastomeric Cellular

Insulation shall be covered, in accordance with manufacturer's recommendations, with a factory applied Type II jacket or field applied aluminum where required or seal welded PVC.

3.2.3.3 Insulation for Straight Runs

- a. Insulation shall be applied to the pipe with joints tightly butted.
- b. Longitudinal laps of the jacket material shall overlap not less than 1-1/2 inches, and butt strips 3 inches wide shall be provided for circumferential joints.

- c. Laps and butt strips shall be secured with adhesive and stapled on 4 inch centers if not factory self-sealing. Adhesive may be omitted where pipe is concealed.
- d. Factory self-sealing lap systems may be used when the ambient temperature is between 40 degrees and 120 degrees F and shall be installed in accordance with manufacturer's instructions. Laps and butt strips shall be stapled whenever there is nonadhesion of the system. Where gaps occur, the section shall be replaced or the gap repaired by applying adhesive under the lap and then stapling.
- e. Breaks and punctures in the jacket material shall be patched by either wrapping a strip of jacket material around the pipe and securing with adhesive and staple on 4 inch centers (if not factory self-sealing), or patching with tape and sealing with a brush coat of vapor retarder coating. Adhesive may be omitted where pipe is concealed. Patch shall extend not less than 1-1/2 inches past the break.
- f. Flexible elastomeric cellular pipe insulation shall be installed by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be secured and sealed with adhesive. When using self seal products only the butt joints shall be secured with adhesive. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation may result in open seams and joints. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives shall be used.

3.2.3.4 Insulation for Fittings and Accessories

- a. Pipe insulation shall be tightly butted to the insulation of the fittings and accessories.
- b. Precut or preformed insulation shall be placed around all fittings and accessories and shall conform to MICA plates, except as modified herein: 5 for anchors; 10, 11, 12, and 13 for fittings; 14, 15 and 16 for valves; 17 for flanges and unions; and 18 for couplings. Insulation shall be the same as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow".
- c. Upon completion of installation of insulation on flanges, unions, valves, anchors, fittings and accessories, terminations and insulation not protected by factory vapor retarder jackets or PVC fitting covers shall be protected with two coats of adhesive applied with glass tape embedded between coats. Tape seams shall overlap 1 inch. Adhesive shall extend onto the adjoining insulation not less than 2 inches. The total dry film thickness shall be not less than 1/16 inch.
- d. Insulation terminations shall be tapered to unions at a 45-degree

angle.

- e. At the option of the Contractor, factory premolded one- or two-piece PVC fitting covers may be used in lieu of the adhesive and embedded glass tape. Factory premolded segments or factory or field cut blanket insert insulation segments shall be used under the cover and shall be the same thickness as adjoining pipe insulation. The covers shall be secured by PVC vapor retarder tape, adhesive, seal-welding or with tacks made for securing PVC covers.

3.2.4 Piping Exposed to Weather

Piping exposed to weather shall be insulated and jacketed as specified for the applicable service inside the building. After this procedure, an aluminum jacket or PVC jacket shall be applied. PVC jacketing requires no factory applied jacket beneath it, however an all service jacket shall be applied if factory applied jacketing is not furnished.

3.2.4.1 Aluminum Jacket

The jacket for hot piping may be factory applied. The jacket shall overlap not less than 2 inches at longitudinal and circumferential joints and shall be secured with bands at not more than 12 inch centers. Longitudinal joints shall be overlapped down to shed water and located at 4 or 8 o'clock positions. Joints on piping 60 degrees F and below shall be sealed with caulking while overlapping to prevent moisture penetration. Where jacketing on piping 60 degrees F and below abuts an uninsulated surface, joints shall be caulked to prevent moisture penetration. Joints on piping above 60 degrees F shall be sealed with a moisture retarder.

3.2.4.2 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and finished as specified for the applicable service. Two coats of breather emulsion type weatherproof mastic (impermeable to water, permeable to air) recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 1 inch and the adjoining aluminum jacket not less than 2 inches. Factory preformed aluminum jackets may be used in lieu of the above. Molded PVC fitting covers shall be provided when PVC jackets are used for straight runs of pipe. PVC fitting covers shall have adhesive welded joints and shall be weatherproof.

3.2.4.3 PVC Jacket

PVC jacket shall be ultraviolet resistant and adhesive welded weather tight with manufacturer's recommended adhesive. Installation shall include provision for thermal expansion.

3.3 DUCT INSULATION INSTALLATION

Corner angles shall be installed on external corners of insulation on ductwork in exposed finished spaces before covering with jacket. Duct insulation shall be omitted on the following:

- a. Ducts shown to be internally lined with insulation or sound absorbing material, unless indicated otherwise.

b. Exposed supply and return ducts in air conditioned spaces, unless otherwise shown. Air conditioned spaces shall be defined as those spaces directly supplied with cooled conditioned air, hot or cold, or provided with a cooling or heating device such as a fan-coil unit.

c. Duct portions inside walls or floor-ceiling space in which both sides of the space are exposed to conditioned air and the space is not vented or exposed to unconditioned air.

3.3.1 Insulation and Vapor Retarder for Ductwork

Insulation and vapor retarder shall be provided to a thickness of 2 inches for the following cold air ducts below 60 degrees F and associated equipment.

a. Supply and return airducts located in duct chases.

b. Round supply ducts.

Insulation for rectangular ducts shall be flexible type where concealed, minimum density 3/4 pcf and rigid type where exposed, minimum density 3 pcf.

Insulation for round ducts shall be flexible type, minimum density 3/4 pcf with a factory Type I or II jacket; or, a semi rigid board, minimum density 3 pcf, formed or fabricated to a tight fit, edges beveled and joints tightly butted and staggered, with a factory applied Type I or II all service jacket. Insulation for exposed ducts shall be provided with either a white, paintable, factory-applied Type I jacket or a vapor retarder jacket coating finish as specified. Vapor retarder coating finish where specified to be used shall be accomplished by applying two coats of vapor retarder coating with a layer of glass cloth embedded between the coats. Insulation on concealed duct shall be provided with a factory-applied Type I or II vapor retarder jacket. The total dry film thickness shall be approximately 1/16 inch.. Duct insulation shall be continuous through sleeves and prepared openings except fire wall penetrations. Duct insulation terminating at fire dampers, shall be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor retarder shall cover the collar, neck, and any uninsulated surfaces of diffusers, registers and grills. Vapor retarder materials shall be applied to form a complete unbroken vapor seal over the insulation. Sheet Metal Duct shall be sealed in accordance with Section 15895A AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM. All supply and return ducts in attics, basements and crawlspace shall be internally lined as specified in Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

3.3.1.1 Installation on Concealed Duct

a. For rectangular, or round ducts, insulation shall be attached by applying adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.

b. For rectangular ducts, 24 inches and larger insulation shall be additionally secured to bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.

c. For rectangular, and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners

shall be spaced on 16 inch centers and not more than 16 inches from duct corners.

- d. Insulation shall be impaled on the mechanical fasteners (self stick pins) where used and shall be pressed thoroughly into the adhesive. Care shall be taken to ensure vapor retarder jacket joints overlap 2 inches. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type duct hangers.
- e. Self-locking washers shall be installed where mechanical fasteners are used. The pin shall be trimmed back and bent over.
- f. Jacket overlaps shall be secured with staples and tape as necessary to ensure a secure seal. Staples, tape and seams shall be coated with a brush coat of vapor retarder coating.
- g. Breaks in the jacket material shall be covered with patches of the same material as the vapor retarder jacket. The patches shall extend not less than 2 inches beyond the break or penetration in all directions and shall be secured with tape and staples. Staples and tape joints shall be sealed with a brush coat of vapor retarder coating.
- h. At jacket penetrations such as hangers, thermometers, and damper operating rods, voids in the insulation shall be filled and the penetration sealed with a brush coat of vapor retarder coating.
- i. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish or tape with a brush coat of vapor retarder coating.. The coating shall overlap the adjoining insulation and uninsulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.
- j. Where insulation standoff brackets occur, insulation shall be extended under the bracket and the jacket terminated at the bracket.

3.3.1.2 Installation on Exposed Duct Work

- a. For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches.
- b. Duct insulation shall be formed with minimum jacket seams. Each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. When the height of projections is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor retarder jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over.
- c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and the pin trimmed or bent over.

- d. Joints in the insulation jacket shall be sealed with a 4 inchwide strip of tape. Tape seams shall be sealed with a brush coat of vapor retarder coating.
- e. Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with tape and stapled. Staples and joints shall be sealed with a brush coat of vapor retarder coating.
- f. At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a brush coat of vapor retarder coating.
- g. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish. The coating shall overlap the adjoining insulation and uninsulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.
- h. Round ducts, flexible type, shall be insulated with factory Type I jacket insulation with minimum density of 3/4 pcf, attached as per MICA standards.

3.3.2 Duct Test Holes

After duct systems have been tested, adjusted, and balanced, breaks in the insulation and jacket shall be repaired in accordance with the applicable section of this specification for the type of duct insulation to be repaired.

-- End of Section --

SECTION 15190A

GAS PIPING SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN GAS ASSOCIATION (AGA)

AGA Manual (1994; Addenda/Correction Jan 1996) A.G.A.
Plastic Pipe Manual for Gas Service

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.45 (1995) Flexible Connectors of Other Than
All-Metal Construction for Gas Appliances

ANSI Z21.69 (1999) Connectors for Movable Gas Appliances

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 539 (1999) Electric-Resistance-Welded Coiled
Steel Tubing for Gas and Fuel Oil Lines

ASTM B 280 (1999) Seamless Copper Tube for Air
Conditioning and Refrigeration Field Service

ASTM B 88 (1999) Seamless Copper Water Tube

ASME INTERNATIONAL (ASME)

ASME B1.20.1 (1983; R 1992) Pipe Threads, General
Purpose (Inch)

ASME B16.11 (1996) Forged Fittings, Socket-Welding and
Threaded

ASME B16.21 (1992) Nonmetallic Flat Gaskets for Pipe
Flanges

ASME B16.3 (1998) Malleable Iron Threaded Fittings

ASME B16.33 (1990) Manually Operated Metallic Gas
Valves for Use in Gas Piping Systems Up to
125 psig (Sizes 1/2 through 2

ASME B16.5 (1996; B16.5a) Pipe Flanges and Flanged
Fittings NPS 1/2 thru NPS 24

ASME B16.9 (1993) Factory-Made Wrought Steel
Buttwelding Fittings

ASME B36.10M (1996) Welded and Seamless Wrought Steel Pipe

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25 (1998) Standard Marking System for Valves, Fittings, Flanges and Unions

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54 (1999) National Fuel Gas Code

NFPA 70 (1999) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL Gas&Oil Dir (1999) Gas and Oil Equipment Directory

1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Asbestos or products containing asbestos shall not be used. Manufacturer's descriptive data and installation instructions shall be submitted for approval for compression-type mechanical joints used in joining dissimilar materials and for insulating joints. Valves, flanges and fittings shall be marked in accordance with MSS SP-25.

1.2.2 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Gas Piping System;

Drawings showing location, size and all branches of pipeline;

location of all required shutoff valves; and instructions necessary for the installation of connectors and supports.

SD-03 Product Data

Qualifications;

Qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

2.1.1 Steel Pipe, Joints, and Fittings

Steel pipe shall conform to ASME B36.10M. Malleable-iron threaded fittings shall conform to ASME B16.3. Steel pipe flanges and flanged fittings including bolts, nuts, and bolt pattern shall be in accordance with ASME B16.5. Wrought steel butt welding fittings shall conform to ASME B16.9. Socket welding and threaded forged steel fittings shall conform to ASME B16.11.

2.1.2 Copper Tubing, Joints and Fittings

Copper tubing shall conform to ASTM B 88, Type K or L, or ASTM B 280. Tubing joints shall be made up with tubing fittings recommended by the tubing manufacturer.

2.1.3 Steel Tubing, Joints and Fittings

Steel tubing shall conform to ASTM A 539. Tubing joints shall be made up with gas tubing fittings recommended by the tubing manufacturer.

2.1.4 Sealants for Steel Pipe Threaded Joints

Joint sealing compound shall be listed in UL Gas&Oil Dir, Class 20 or less. Tetrafluoroethylene tape shall conform to UL Gas&Oil Dir.

2.1.5 Identification

Pipe flow markings and metal tags shall be provided as required.

2.1.6 Flange Gaskets

Gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full face or self-centering flat ring type. The gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR) suitable for a maximum 600 degree F service. NBR binder shall be used for hydrocarbon service.

2.1.7 Pipe Threads

Pipe threads shall conform to ASME B1.20.1.

2.1.8 Escutcheons

Escutcheons shall be chromium-plated steel or chromium-plated brass, either one piece or split pattern, held in place by internal spring tension or set

screw.

2.1.9 Insulating Pipe Joints

2.1.9.1 Insulating Joint Material

Insulating joint material shall be provided between flanged or threaded metallic pipe systems where shown to control galvanic or electrical action.

2.1.9.2 Threaded Pipe Joints

Joints for threaded pipe shall be steel body nut type dielectric unions with insulating gaskets.

2.1.9.3 Flanged Pipe Joints

Joints for flanged pipe shall consist of full face sandwich-type flange insulating gasket of the dielectric type, insulating sleeves for flange bolts, and insulating washers for flange nuts.

2.1.10 Flexible Connectors

Flexible connectors for connecting gas utilization equipment to building gas piping shall conform to ANSI Z21.45. Flexible connectors for movable food service equipment shall conform to ANSI Z21.69.

2.2 VALVES

Valves shall be suitable for shutoff or isolation service and shall conform to the following:

2.2.1 Valves 2 Inches and Smaller

Valves 2 inches and smaller shall conform to ASME B16.33 and shall be of materials and manufacture compatible with system materials used.

2.3 PIPE HANGERS AND SUPPORTS

Pipe hangers and supports shall conform to MSS SP-58 and MSS SP-69.

2.4 METERS, REGULATORS AND SHUTOFF VALVES

Meters, regulators and shutoff valves shall be as specified in Section 02556A GAS DISTRIBUTION SYSTEM.

PART 3 EXECUTION

3.1 EXCAVATION AND BACKFILLING

Earthwork shall be as specified in Section 02316A EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2 GAS PIPING SYSTEM

Gas piping system shall be from the point of delivery, defined as the outlet of the service regulator specified in Section 02556A GAS DISTRIBUTION SYSTEM, to the connections to each gas utilization device.

3.2.1 Protection of Materials and Components

Pipe and tube openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage. At the completion of all work, the entire system shall be thoroughly cleaned.

3.2.2 Workmanship and Defects

Piping, tubing and fittings shall be clear and free of cutting burrs and defects in structure or threading and shall be thoroughly brushed and chip-and scale-blown. Defects in piping, tubing or fittings shall not be repaired. When defective piping, tubing, or fittings are located in a system, the defective material shall be replaced.

3.3 PROTECTIVE COVERING

3.3.1 Underground Metallic Pipe

Buried metallic piping shall be protected from corrosion with protective coatings as specified in Section 02556A GAS DISTRIBUTION SYSTEM. When dissimilar metals are joined underground, gastight insulating fittings shall be used.

3.3.2 Aboveground Metallic Piping Systems

3.3.2.1 Ferrous Surfaces

Shop primed surfaces shall be touched up with ferrous metal primer. Surfaces that have not been shop primed shall be solvent cleaned. Surfaces that contain loose rust, loose mill scale and other foreign substances shall be mechanically cleaned by power wire brushing and primed with ferrous metal primer. Primed surface shall be finished with two coats of exterior oil paint.

3.4 INSTALLATION

Installation of the gas system shall be in conformance with the manufacturer's recommendations and applicable provisions of NFPA 54, AGA Manual, and as indicated. Pipe cutting shall be done without damage to the pipe. Unless otherwise authorized, cutting shall be done by an approved type of mechanical cutter. Wheel cutters shall be used where practicable.

3.4.1 Metallic Piping Installation

Underground piping shall be buried a minimum of 18 inches below grade. Changes in direction of piping shall be made with fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Aluminum alloy pipe shall not be used in exterior locations or underground.

3.4.2 Metallic Tubing Installation

Metallic tubing shall be installed using gas tubing fittings approved by the tubing manufacturer. Branch connections shall be made with tees. All tubing end preparation shall be made with tools designed for the purpose. Aluminum alloy tubing shall not be used in exterior locations or

underground.

3.4.3 Concealed Piping in Buildings

When installing piping which is to be concealed, unions, tubing fittings, running threads, right- and left-hand couplings, bushings, and swing joints made by combinations of fittings shall not be used.

3.4.3.1 Piping in Partitions

Concealed piping shall be located in hollow rather than solid partitions. Tubing passing through walls or partitions shall be protected against physical damage.

3.4.4 Aboveground Piping

Aboveground piping shall be run as straight as practicable along the alignment indicated and with a minimum of joints. Piping shall be separately supported.

3.4.5 Final Gas Connections

Unless otherwise specified, final connections shall be made with rigid metallic pipe and fittings. Final connections to kitchen ranges shall be made using flexible connectors not less than 40 in. long. Flexible connectors may be used for final connections to gas utilization equipment. In addition to cautions listed in instructions required by ANSI standards for flexible connectors, insure that flexible connectors do not pass through equipment cabinet. Provide accessible gas shutoff valve and coupling for each gas equipment item.

3.5 PIPE JOINTS

Pipe joints shall be designed and installed to effectively sustain the longitudinal pull-out forces caused by contraction of the piping or superimposed loads.

3.5.1 Threaded Metallic Joints

Threaded joints in metallic pipe shall have tapered threads evenly cut and shall be made with UL approved graphite joint sealing compound for gas service or tetrafluoroethylene tape applied to the male threads only. Threaded joints up to 1-1/2 inches in diameter may be made with approved tetrafluoroethylene tape. Threaded joints up to 2 inches in diameter may be made with approved joint sealing compound. After cutting and before threading, pipe shall be reamed and burrs shall be removed. Caulking of threaded joints to stop or prevent leaks shall not be permitted.

3.5.2 Flared Metallic Tubing Joints

Flared joints in metallic tubing shall be made with special tools recommended by the tubing manufacturer. Flared joints shall be used only in systems constructed from nonferrous pipe and tubing, when experience or tests have demonstrated that the joint is suitable for the conditions, and when adequate provisions are made in the design to prevent separation of the joints. Metallic ball sleeve compression-type tubing fittings shall not be used for tubing joints.

3.5.3 Solder or Brazed Joints

Joints in metallic tubing and fittings shall be made with materials and procedures recommended by the tubing supplier. Joints shall be brazed with material having a melting point above 1000 degrees F. Brazing alloys shall not contain phosphorous.

3.6 PIPE SLEEVES

Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall not be installed in structural members except where indicated or approved. All rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective wall, floor or roof, and shall be cut flush with each surface, except in mechanical room floors not located on grade where clamping flanges or riser pipe clamps are used. Sleeves in mechanical room floors above grade shall extend at least 4 inches above finish floor. Unless otherwise indicated, sleeves shall be large enough to provide a minimum clearance of 1/4 inch all around the pipe. Sleeves in bearing walls, waterproofing membrane floors, and wet areas shall be steel pipe. Sleeves in nonbearing walls, floors, or ceilings may be steel pipe, galvanized sheet metal with lock-type longitudinal seam, or moisture-resistant fiber or plastic. For penetrations of fire walls, fire partitions and floors which are not on grade, the annular space between the pipe and sleeve shall be sealed with firestopping material and sealant that meet the requirement of Section 07840A FIRESTOPPING.

3.7 PIPES PENETRATING WATERPROOFING MEMBRANES

Pipes penetrating waterproofing membranes shall be installed as specified in Section 15400A PLUMBING, GENERAL PURPOSE.

3.8 FIRE SEAL

Penetrations of fire rated partitions, walls and floors shall be in accordance with Section 07840A FIRESTOPPING.

3.9 ESCUTCHEONS

Escutcheons shall be provided for all finished surfaces where gas piping passes through floors, walls, or ceilings except in boiler, utility, or equipment rooms.

3.10 SPECIAL REQUIREMENTS

Drips, grading of the lines, freeze protection, and branch outlet locations shall be as shown and shall conform to the requirements of NFPA 54.

3.11 BUILDING STRUCTURE

Building structure shall not be weakened by the installation of any gas piping. Beams or joists shall not be cut or notched.

3.12 PIPING SYSTEM SUPPORTS

Gas piping systems in buildings shall be supported with pipe hooks, metal pipe straps, bands or hangers suitable for the size of piping or tubing. Gas piping system shall not be supported by other piping. Spacing of supports in gas piping and tubing installations shall conform to the

requirements of NFPA 54. The selection and application of supports in gas piping and tubing installations shall conform to the requirements of MSS SP-69. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for any of the individual pipes in the multiple pipe run. The clips or clamps shall be rigidly connected to the common base member. A clearance of 1/8 inch shall be provided between the pipe and clip or clamp for all piping which may be subjected to thermal expansion.

3.13 ELECTRICAL BONDING AND GROUNDING

The gas piping system within the building shall be electrically continuous and bonded to a grounding electrode as required by NFPA 70. Conventional flange joints allow sufficient current flow to satisfy this requirement.

3.14 SHUTOFF VALVE

Main gas shutoff valve controlling the gas piping system shall be easily accessible for operation and shall be installed as indicated, protected from physical damage, and marked with a metal tag to clearly identify the piping system controlled.

3.15 TESTING

Before any section of a gas piping system is put into service, it shall be carefully tested to assure that it is gastight. Prior to testing, the system shall be blown out, cleaned and cleared of all foreign material. Each joint shall be tested by means of an approved gas detector, soap and water, or an equivalent nonflammable solution. Testing shall be completed before any work is covered, enclosed, or concealed. All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage and bracing suitably designed to resist test pressures shall be installed if necessary. Oxygen shall not be used as a testing medium.

3.15.1 Pressure Tests

Before appliances are connected, piping systems shall be filled with air or an inert gas and shall withstand a minimum pressure of 3 pounds gauge for a period of not less than 10 minutes as specified in NFPA 54 without showing any drop in pressure. Oxygen shall not be used. Pressure shall be measured with a mercury manometer, slope gauge, or an equivalent device so calibrated as to be read in increments of not greater than 0.1 pound. The source of pressure shall be isolated before the pressure tests are made.

3.15.2 Test With Gas

Before turning gas under pressure into any piping, all openings from which gas can escape shall be closed. Immediately after turning on the gas, the piping system shall be checked for leakage by using a laboratory-certified gas meter, an appliance orifice, a manometer, or equivalent device. All testing shall conform to the requirements of NFPA 54. If leakage is recorded, the gas supply shall be shut off, the leak shall be repaired, and the tests repeated until all leaks have been stopped.

3.15.3 Purging

After testing is completed, and before connecting any appliances, all gas piping shall be fully purged. Piping shall not be purged into the combustion chamber of an appliance. The open end of piping systems being purged shall not discharge into confined spaces or areas where there are ignition sources unless the safety precautions recommended in NFPA 54 are followed.

3.15.4 Labor, Materials and Equipment

All labor, materials and equipment necessary for conducting the testing and purging shall be furnished by the Contractor.

-- End of Section --

SECTION 15400A

PLUMBING, GENERAL PURPOSE
01/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- | | |
|---------------|---|
| ANSI Z21.10.1 | (1998; Z21.10.1a; Z21.10.1b; Z21.10.1c) Gas Water Heaters Vol. I, Storage Water Heaters with Input Ratings of 75,000 Btu Per Hour or Less |
| ANSI Z21.10.3 | (1998) Gas Water Heaters Vol.III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous Water Heaters |
| ANSI Z21.22 | (1999) Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-----------------|---|
| ASTM A 53/A 53M | (2001) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM A 733 | (1999) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples |
| ASTM A 74 | (1998) Cast Iron Soil Pipe and Fittings |
| ASTM A 888 | (1998e1) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications |
| ASTM B 306 | (1999) Copper Drainage Tube (DWV) |
| ASTM B 32 | (1996) Solder Metal |
| ASTM B 370 | (1998) Copper Sheet and Strip for Building Construction |
| ASTM B 42 | (1998) Seamless Copper Pipe, Standard Sizes |
| ASTM B 43 | (1998) Seamless Red Brass Pipe, Standard Sizes |
| ASTM B 813 | (2000) Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube |

ASTM B 88	(1999) Seamless Copper Water Tube
ASTM B 88M	(1999) Seamless Copper Water Tube (Metric)
ASTM C 564	(1997) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM D 2000	(1999) Rubber Products in Automotive Applications
ASTM D 2235	(1996a) Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2661	(1997a) Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2665	(2000) Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2822	(1991; R 1997e) Asphalt Roof Cement
ASTM D 2855	(1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3138	(1995) Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components
ASTM D 3139	(1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3308	(1997) PTFE Resin Skived Tape
ASTM D 3311	(1994) Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM F 1760	(1997) Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
ASTM F 477	(1999) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 493	(1997) Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
ASTM F 628	(2000) Acrylonitrile-Butadiene-Styrene

(ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core

ASTM F 891 (2000) Coextruded Poly (Vinyl chloride)
(PVC) Plastic Pipe with a Cellular Core

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1002 (1986) Water Closet Flush Tank Ball Cocks

ASSE 1003 (1995) Water Pressure Reducing Valves for Domestic Water Supply Systems

ASSE 1005 (1986) Water Heater Drain Valves - 3/4-Inch Iron Pipe Size

ASSE 1011 (1995) Hose Connection Vacuum Breakers

ASSE 1012 (1995) Backflow Preventers with Intermediate Atmospheric Vent

ASSE 1013 (1999) Reduced Pressure Principle Backflow Preventers

ASSE 1018 (1986) Trap Seal Primer Valves Water Supply Fed

AMERICAN WATER WORKS ASSOCIATION(AWWA)

AWWA B300 (1999) Hypochlorites

AWWA B301 (1992; Addenda B301a - 1999) Liquid Chlorine

AWWA C105 (1999) Polyethylene Encasement for Ductile-Iron Pipe Systems

AWWA C203 (1997; Addenda C203a - 1999) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

AWWA C606 (1997) Grooved and Shouldered Joints

AWWA EWW (1999) Standard Methods for the Examination of Water and Wastewater

AWWA M20 (1973) Manual: Water Chlorination Principles and Practices

ASME INTERNATIONAL (ASME)

ASME A112.14.1 (1975; R 1998) Backwater Valves

ASME A112.19.1M (1994; R 1999) Enameled Cast Iron Plumbing Fixtures

ASME A112.19.2M (1998) Vitreous China Plumbing Fixtures

ASME A112.19.3M	(1987; R 1996) Stainless Steel Plumbing Fixtures (Designed for Residential Use)
ASME A112.19.4M	(1994; Errata Nov 1996) Porcelain Enameled Formed Steel Plumbing Fixtures
ASME A112.21.1M	(1991; R 1998) Floor Drains
ASME A112.36.2M	(1991; R 1998) Cleanouts
ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.12	(1998) Cast Iron Threaded Drainage Fittings
ASME B16.15	(1985; R 1994) Cast Bronze Threaded Fittings Classes 125 and 250
ASME B16.18	(1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(1995; B16.22a1998) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(1992; Errata Jan 1994) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.24	(1991; R 1998) Cast Copper Alloy Pipe Flanges, Class 150, 300, 400, 600, 900, 1500, and 2500, and Flanged Fittings, Class 150 and 300
ASME B16.29	(1994) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.4	(1998) Gray Iron Threaded Fittings
ASME B31.5	(1992; B31.5a1994) Refrigeration Piping

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(1997) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI HSN-85	(1985) Neoprene Rubber Gaskets for Hub and Spigot Cast Iron Soil Pipe and Fittings

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA Tube Handbook	(1995) Copper Tube Handbook
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FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)

FCCCHR-CCC (1993) Manual of Cross-Connection Control

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS
(IAPMO)

IAPMO Z124.5 (1997) Plastic Toilet (Water Closets) Seats

INTERNATIONAL CODE COUNCIL (ICC)

CABO A117.1 (1998) Accessible and Usable Buildings and Facilities

ICC Plumbing Code (2000) International Plumbing Code (IPA)

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-110 (1996) Ball Valves Threaded,
Socket-Welding, Solder Joint, Grooved and
Flared Ends

MSS SP-58 (1993) Pipe Hangers and Supports -
Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports -
Selection and Application

MSS SP-73 (1991; R 1996) Brazing Joints for Copper
and Copper Alloy Pressure Fittings

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check
Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1997) Enclosures for Electrical Equipment
(1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54 (1999) National Fuel Gas Code

NFPA 90A (1999) Installation of Air Conditioning and
Ventilating Systems

NSF INTERNATIONAL (NSF)

NSF 14 (1999) Plastics Piping Components and
Related Materials

NSF 61 (1999) Drinking Water System Components -
Health Effects (Sections 1-9)

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

PPFA-01 (1998) Plastic Pipe in Fire Resistive
Construction

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI WH 201 (1992) Water Hammer Arresters

PLUMBING-HEATING-COOLING CONTRACTORS NATIONAL ASSOCIATION (NAPHCC)

NAPHCC Plumbing Code (1996) National Standard Plumbing Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J 1508 (1997) Hose Clamps

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-50012 (Basic) Garbage Disposal Machine, Commercial

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

PL 93-523 (1974; Amended 1986) Safe Drinking Water Act

1.2 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening.

1.3 ELECTRICAL WORK

Motors, motor controllers and motor efficiencies shall conform to the requirements of Section 16415A ELECTRICAL WORK, INTERIOR.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plumbing System; .

Detail drawings consisting of illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operations of each system. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

SD-03 Product Data

Plumbing Fixture Schedule; G,ED.

Catalog cuts of specified plumbing fixtures.

Plumbing System;.

Diagrams, instructions, and other sheets proposed for posting.

SD-07 Certificates

Materials and Equipment;

Where materials or equipment are specified to comply with requirements of AGA, ASME, or NSF proof of such compliance shall be included. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, a written certificate may be submitted from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency. Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

SD-10 Operation and Maintenance Data

Plumbing System;

Six copies of the operation manual outlining the step-by-step procedures required for system startup, operation and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of the maintenance manual listing routine maintenance procedures, possible breakdowns and repairs. The manual shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed.

1.5 REGULATORY REQUIREMENTS

Plumbing work shall be in accordance with ICC Plumbing Code.

1.6 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

PART 2 PRODUCTS

2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I and II.

Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal

"NSF-PW." Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing lead shall not be used in any potable water system. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with PL 93-523 and NSF 61, Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of NSF 61, Section 9. Hubless cast-iron soil pipe shall not be installed underground or under concrete floor slabs. Plastic pipe shall not be installed in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

2.1.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe shall not be used under ground. Joints and gasket materials shall conform to the following:

- a. Coupling for Cast-Iron Pipe: for hub and spigot type ASTM A 74, AWWA C606.
- b. Coupling for Steel Pipe: AWWA C606.
- d. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with ASME B16.21.
- e. Neoprene Gaskets for Hub and Cast-Iron Pipe and Fittings: CISPI HSN-85.
- h. Solder Material: Solder metal shall conform to ASTM B 32 95-5 tin-antimony.
- i. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B 813, Standard Test 1.
- j. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe, ASTM D 3308.
- k. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type): ASTM C 564.
- l. Rubber Gaskets for Grooved Pipe: ASTM D 2000, maximum temperature 230 degrees F.
- m. Flexible Elastomeric Seals: ASTM D 3139, ASTM D 3212 or ASTM F 477.
- o. Solvent Cement for Transition Joints between ABS and PVC Nonpressure Piping Components: ASTM D 3138.
- p. Plastic Solvent Cement for ABS Plastic Pipe: ASTM D 2235.
- q. Plastic Solvent Cement for PVC Plastic Pipe: ASTM D 2564 and ASTM D 2855.
- r. Plastic Solvent Cement for CPVC Plastic Pipe: ASTM F 493.

2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

- a. Water Hammer Arrestor: PDI WH 201.
- b. Copper, Sheet and Strip for Building Construction: ASTM B 370.
- c. Asphalt Roof Cement: ASTM D 2822.
- d. Hose Clamps: SAE J 1508.
- f. Metallic Cleanouts: ASME A112.36.2M.
- g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.
- h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.
- i. Hypochlorites: AWWA B300.
- j. Liquid Chlorine: AWWA B301.
- k. Polyethylene Encasement for Ductile-Iron Piping: AWWA C105.

2.1.3 Pipe Insulation Material

Insulation shall be as specified in Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.2 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.3 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves shall be gate valves unless otherwise indicated. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Pressure ratings shall be based upon the application. Valves used for water service shall have the Zinc content limited to no more than 6 percent for the stem, body, bonnet, wedge or disk in contact with the fluid. Valves shall conform to the following standards:

Description	Standard
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22
Water Pressure Reducing Valves	ASSE 1003

Description	Standard
Water Heater Drain Valves	ASSE 1005
Trap Seal Primer Valves	ASSE 1018
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22

2.3.1 Freeze Proof Wall Faucet/Hose Bibb

Wall faucets/Hose bibbs with vacuum-breaker backflow preventer shall be brass with 3/4 inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection. Faucet handle shall be securely attached to stem. Wall faucets/Hose bibbs shall be designed and installed such that the operating valve is located within the conditioned space.

2.3.2 Relief Valves

Water heaters and hot water storage tanks shall have a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve shall have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Relief valves shall be rated according to ANSI Z21.22. Relief valves for systems where the maximum rate of heat input is less than 200,000 Btuh shall have 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where the maximum rate of heat input is greater than 200,000 Btuh shall have 1 inch minimum inlets, and 1 inch outlets. The discharge pipe from the relief valve shall be the size of the valve outlet.

2.4 FIXTURES

Fixtures shall be water conservation type, in accordance with ICC Plumbing Code. Fixtures for use by the physically handicapped shall be in accordance with CABO A117.1. Vitreous china, nonabsorbent, hard-burned, and vitrified throughout the body shall be provided. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap.

Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Internal parts of flush and/or flushometer valves, shower mixing valves, shower head face plates, pop-up stoppers of lavatory waste drains, and pop-up stoppers and overflow tees and shoes of bathtub waste drains may contain acetal resin, fluorocarbon, nylon, acrylonitrile-butadiene-styrene (ABS) or other plastic material, if the material has provided satisfactory service under actual commercial or industrial operating conditions for not less than 2 years. Plastic in contact with hot water shall be suitable for 180 degrees F water temperature. Plumbing fixtures shall be as indicated in paragraph PLUMBING FIXTURE SCHEDULE.

2.5 BACKFLOW PREVENTERS

Backflow preventers shall be approved and listed by the Foundation For Cross-Connection Control & Hydraulic Research. Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be tested, approved, and listed in accordance with FCCCHR-CCC. Backflow preventers with intermediate atmospheric vent shall conform to ASSE 1012. Reduced pressure principle backflow preventers shall conform to ASSE 1013. Hose connection vacuum breakers shall conform to ASSE 1011.

2.6 DRAINS

2.6.1 Floor Drains

Floor drains shall consist of a galvanized body and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C 564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor drains shall conform to ASME A112.21.1M.

2.7 TRAPS

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast-iron. Traps installed on steel pipe or copper tubing shall be recess-drainage or brass-tube type. Traps for floor drains or hub drains in mechanical rooms shall be of the deep-seal design.

2.8 WATER HEATERS

Water heater types and capacities shall be as indicated.

2.8.1 Automatic Storage Type

Heaters shall be complete with control system and shall have ASME rated combination pressure and temperature relief valve.

2.8.1.1 Gas-Fired Type

Gas-fired water heaters shall conform to ANSI Z21.10.1 when input is 75,000 BTU per hour or less or ANSI Z21.10.3 for heaters with input greater than 75,000 BTU per hour.

2.9 PUMPS

2.9.1 Sump Pumps

Sump pumps shall be of capacities indicated. The pumps shall be of the automatic, electric motor-driven, submerged type, complete with necessary control equipment and with a split or solid cast-iron or steel cover plate. The pumps shall be direct-connected by an approved flexible coupling to a

vertical electric motor having a continuous oiling device or packed bearings sealed against dirt and moisture. Motors shall be totally enclosed, fan-cooled of sizes as indicated and shall be equipped with an across-the-line magnetic controller in a NEMA 250, Type 4 enclosure. Each pump shall be fitted with a high-grade thrust bearing mounted above the floor. Each shaft shall have an alignment bearing at each end, and the suction inlet shall be between 3 and 6 inches above the sump bottom. The suction side of each pump shall have a strainer of ample capacity. A float switch assembly, with the switch completely enclosed in a NEMA 250, Type 4 enclosure, shall start and stop each motor at predetermined water levels.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to NFPA 90A requirements. Plastic pipe shall not be installed in air plenums. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA-01. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended 5 feet outside the building, unless otherwise indicated. A gate valve or full port ball valve and drain shall be installed on the water service line inside the building approximately 6 inches above the point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches. Exterior underground utilities shall be at least 12 inches below the average local frost depth or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

3.1.1 Water Pipe, Fittings, and Connections

3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation.

Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and gate valve ahead of hose bibb.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining.

3.1.1.7 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall conform to PDI WH 201. Vertical capped pipe columns will not be permitted.

3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.2.2 Unions and Flanges

Unions shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller.

3.1.2.3 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.2.4 Copper Tube and Pipe

The tube or fittings shall not be annealed when making connections.

- b. Soldered. Soldered joints shall be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints shall conform to ASME B31.5 and CDA Tube Handbook.
- c. Copper Tube Extracted Joint. An extracted mechanical joint may be made in copper tube. Joint shall be produced with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, dimpled depth stops shall be provided. Branch tube shall be notched for proper penetration into fitting to assure a free flow joint. Extracted joints shall be brazed in accordance with NAPHCC Plumbing Code using B-cup series filler metal in accordance with MSS SP-73. Soldered extracted joints will not be permitted.

3.1.2.5 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe shall have joints made with solvent cement. PVC and CPVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

3.1.2.6 Other Joint Methods

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be made with dielectric unions or flange waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the

specific purpose.

3.1.4 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.4.1 Sleeve Requirements

Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves are not required for supply, drainage, waste and vent pipe passing through concrete slab on grade, except where penetrating a membrane waterproof floor. A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved. Sleeves shall not be installed in structural members, except where indicated or approved. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms shall extend a minimum of 4 inches above the finished floor. Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic. Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated in Section 07900A JOINT SEALING. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated. Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Pipe sleeves in fire-rated walls shall conform to the requirements in Section 07840A FIRESTOPPING.

3.1.4.2 Flashing Requirements

Pipes passing through roof shall be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the

bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

3.1.4.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 8 inches from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1-1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be sealed.

3.1.4.4 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07900A JOINT SEALING.

3.1.5 Fire Seal

Where pipes pass through fire walls, fire-partitions, fire-rated pipe chase walls or floors above grade, a fire seal shall be provided as specified in Section 07840A FIRESTOPPING.

3.1.6 Supports

3.1.6.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded

sections of rods shall not be formed or bent.

3.1.6.2 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe.
- c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.
- d. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Type 39 saddles shall be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39 saddles shall be welded to the pipe.
- h. Type 40 shields shall:
 - (1) Be used on insulated pipe less than 4 inches.
 - (3) Have a high density insert for all pipe sizes. High density inserts shall have a density of 8 pcf or greater.
- i. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs shall include allowances for expansion and contraction.
- j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.
- k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:

(1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.

(2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

1. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.
- m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.

3.1.7 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron or plastic.

3.2 WATER HEATERS AND HOT WATER STORAGE TANKS

3.2.1 Relief Valves

No other valves shall be installed between the relief valve and the water heater or storage tank. The P&T relief valve shall be installed where the valve actuator comes in contact with the hottest water in the heater. The relief valve shall be installed directly in a tapping in the heater. A discharge pipe the full size of the relief valve outlet shall be connected to the valve outlet and terminated to the nearest floor drain.

3.2.2 Installation of Gas-Fired Water Heater

Installation shall conform to NFPA 54 for gas fired water heaters.

3.2.3 Heat Traps

Piping to and from each water heater shall be routed horizontally and downward a minimum of 2 feet before turning in an upward direction.

3.2.4 Connections to Water Heaters

Connections of metallic pipe to water heaters shall be made with dielectric unions or flanges.

3.3 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified. Drain lines and hot water lines of fixtures for handicapped personnel shall be insulated and do not require polished chrome finish. Plumbing fixtures and accessories shall be installed within the space shown.

3.3.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.3.2 Height of Fixture Rims Above Floor

Installation of fixtures for use by the physically handicapped shall be in accordance with CABO A117.1.

3.3.3 Shower Bath Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate shall be made watertight by caulking or gasketing.

3.3.4 Fixture Supports

Fixture supports shall be designed and installed in accordance with the manufacturer's recommendations.

3.3.5 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with ICC Plumbing Code at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and

any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

3.3.6 Access Panels

Access panels shall be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced. Access panels shall be as specified in Section 05500A MISCELLANEOUS METAL.

3.3.7 Traps

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tubing shall be recess-drainage pattern, or brass-tube type. Traps installed on plastic pipe may be plastic conforming to ASTM D 3311.

3.4 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in mechanical rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.5 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09900 PAINTING, GENERAL.

3.6 TESTS, FLUSHING AND DISINFECTION

3.6.1 Plumbing System

The plumbing system shall be tested in accordance with ICC Plumbing Code.

3.6.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.6.3 System Flushing

3.6.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration.

3.6.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation.

3.6.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

- a. Time, date, and duration of test.
- b. Water pressures at the most remote and the highest fixtures.
- c. Operation of each fixture and fixture trim.
- d. Operation of each valve and faucet.
- e. Pump suction and discharge pressures.
- f. Temperature of each domestic hot-water supply.
- g. Operation of each floor drain by flooding with water.
- h. Operation of each vacuum breaker and backflow preventer.

3.6.5 Disinfection

After operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. System shall be flushed as specified, before introducing chlorinating material. The

chlorinating material shall be hypochlorites or liquid chlorine. Water chlorination procedure shall be in accordance with AWWA M20. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the main with a hypochlorinator, or liquid chlorine injected into the main through a solution-feed chlorinator and booster pump, shall be used. The chlorine residual shall be checked at intervals to ensure that the proper level is maintained. Chlorine application shall continue until the entire main is filled. The water shall remain in the system for a minimum of 24 hours. Each valve in the system being disinfected shall be opened and closed several times during the contact period to ensure its proper disinfection. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. Water tanks shall be disinfected by the addition of chlorine directly to the filling water. Following a 6 hour period, no less than 50 ppm chlorine residual shall remain in the tank. If after the 24 hour and 6 hour holding periods, the residual solution contains less than 25 ppm and 50 ppm chlorine respectively, flush the piping and tank with potable water, and repeat the above procedures until the required residual chlorine levels are satisfied. The system including the tanks shall then be flushed with clean water until the residual chlorine level is reduced to less than one part per million. During the flushing period each valve and faucet shall be opened and closed several times. Samples of water in disinfected containers shall be obtained from several locations selected by the Contracting Officer. The samples of water shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA EWW. The testing method used shall be either the multiple-tube fermentation technique or the membrane-filter technique. Disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.7 PLUMBING FIXTURE SCHEDULE

P-1 WATER CLOSET:

Siphon-jet, top supply spud, ASME A112.19.2M, floor mounted. Floor flange shall be copper alloy, cast iron, or plastic. The maximum water use shall be 1.6 gallons per flush.

Gasket shall be wax type.

Seat - IAPMO Z124.5, Type A, white plastic, closed front, residential style.

Flush Tank - An adequate quantity of water shall be provided to flush and clean the fixture served. The water supply to flush tanks equipped for manual flushing shall be controlled by a float valve or other automatic device designed to refill the tank after each discharge, and to completely shut off the water flow to the tank when the tank is filled to operational capacity. Water closets having their flush valve seat located below the flood level rim of the closet bowl shall have a ballcock installed within a sheath or in a separate and isolated compartment of the tank, both to have visible discharge onto the floor in case of failure. Provision shall be made to automatically supply water to the fixture so as to refill the trap seal after each flushing. The water supply to flush tanks equipped for automatic flushing shall be controlled by a suitable timing device. Ballcocks shall meet ASSE 1002.

Flush Valve in Flush Tank - Flush valve seats in tanks for flushing water closets shall be at least 1 inch above the flood level rim of the bowl connected thereto, except in approved water closet and flush tank combinations designed so that when the tank is flushed and the fixture is clogged or partially clogged, the flush valve shall close tightly so that water will not spill continuously over the rim of the bowl or back flow from the bowl to the tank.

Fixture Design - All water closets shall be white in color.

Water closets shall be elongated bowl in all full baths and round bowl in the 1/2 baths. These water closets shall be American Standard "Colony" or approved equal in function, style and appearance.

P-2 SOQ 1/2 BATH LAVATORY:

Manufacturer's standard sink depth, oval, and shall be integral with the vanity tops as specified in Section 06650, SOLID POLYMER(SOLID SURFACING)FABRICATIONS.

Faucet - Faucets shall be dual control, mixing type. Faucets shall have metal replaceable cartridge control unit or metal cartridge units with diaphragm which can be replaced without special tools. Valves and handles shall be copper alloy. Flow shall be limited to 0.25 gallon per cycle at a flowing water pressure of 80 psi if a metering device or fitting is used that limits the period of water discharge such as a foot switch or fixture occupancy sensor. If a metering device is not used, the flow shall be limited to 2.5 gpm at a flowing pressure of 80 psi. Faucet shall be polished chrome finish and shall be Delta 3577-LHP, or approved equal in function, style and appearance.

Handles - Lever type. Finish shall be chrome base with porcelain handles. Faucet handles shall be Delta H22-A22PR, or approved equal in function, style and appearance.

Drain - Pop-up drain shall include stopper, lift rods, jam nut, washer, and tail piece. See paragraph FIXTURES for optional plastic accessories.

P-3 LAVATORY:

Manufacturer's standard sink depth, oval, and shall be integral with the vanity tops as specified in Section 06650, SOLID POLYMER(SOLID SURFACING)FABRICATIONS.

SOQ Unit Faucets - Faucets shall be dual control, mixing type. Faucets shall have metal replaceable cartridge control unit or metal cartridge units with diaphragm which can be replaced without special tools. Valves and handles shall be copper alloy. Connection between valve and spout for center-set faucet shall be of rigid metal tubing. Flow shall be limited to 0.25 gallon per cycle at a flowing water pressure of 80 psi if a metering device or fitting is used that limits the period of water discharge such as a foot switch or fixture occupancy sensor. If a metering device is not used, the flow shall be limited to 2.5 gpm at a flowing pressure of 80 psi. For SOQ Master Bathroom faucets shall be Delta 3577-LHP or approved equal in function, style and appearance. For SOQ Hall Full baths faucet shall be Delta 2521-LHP or approved equal in function, style and appearance. Finish shall be polished chrome.

Enlisted Quarters Faucet - Faucets shall be single control, mixing type.

Faucets shall have metal replaceable cartridge control unit or metal cartridge units with diaphragm which can be replaced without special tools.

Valves and handles shall be copper alloy. Connection between valve and spout for center-set faucet shall be of rigid metal tubing. Flow shall be limited to 0.25 gallon per cycle at a flowing water pressure of 80 psi if a metering device or fitting is used that limits the period of water discharge such as a foot switch or fixture occupancy sensor. If a metering device is not used, the flow shall be limited to 2.5 gpm at a flowing pressure of 80 psi. Faucet shall be Delta 520-WFMPU, polished chrome, or approved equal.

Handles - Lever type. Cast, formed, or drop forged copper alloy. For SOQ Units the handles shall be Delta H22-A22PR, or approved equal in function, style and appearance.

Drain - Pop-up drain shall include stopper, lift rods, jam nut, washer, and tail piece. See paragraph FIXTURES for optional plastic accessories.

P-4 BAR SINK:

Countertop 19 inches x 16 inches enameled cast iron ASME A112.19.1M Color shall be white. Drain shall be stainless steel. Sink shall be Kohler "Apertif" K-6560-2, or approved equal in function, style and appearance.

Faucet and Spout - Cast or wrought copper alloy, gooseneck type with backflow preventer. Faucets shall have replaceable seat and the washer shall rotate onto the seat. Strainers shall have internal threads. Faucet shall be Kohler 2172-LHP, or approved equal in function, style and appearance.

Handles - Cast copper alloy, wrought copper alloy, or stainless steel, lever type. Handles shall be Kohler H22-A22PR, chrome with porcelain handles, or approved equal in function, style and appearance.

P-5 KITCHEN SINK:

Self rimming with holes for faucet and spout and sprayer, double equal bowls 33 x 22 inches enameled cast iron ASME A112.19.1M in the SOQ units and stainless steel ASME A112.19.3M in the Enlisted Quarters. Sink for the SOQ Units shall be Kohler "Brookfiled" K-5942-4, white, or approved equal in function, style and appearance. Sink for the Enlisted Quarters shall be Kohler "Toccata", K-3346-4, or approved equal.

Faucet and Spout - Cast or wrought copper alloy. Aerator shall have internal threads. Flow shall be limited to 0.25 gallon per cycle at a flowing water pressure of 80 psi if a metering device or fitting is used that limits the period of water discharge such as a foot switch or fixture occupancy sensor. If a metering device is not used, the flow shall be limited to 2.5 gpm at a flowing water pressure of 80 psi. Faucet shall include a handspray. For SOQ Units faucet shall be Kohler "Fairfax", K-12172, polished chrome, or approved equal in function, style and appearance. For Enlisted Quarters, faucet shall be Delta 400-WF, or approved equal.

Handle - Cast copper alloy, wrought copper alloy, or stainless steel. Single lever type.

Drain Assembly - Plug, cup strainer, crossbars, jam nuts, washers,

couplings, stopper, etc., shall be copper alloy or stainless steel.

P-6 BATHTUB:

Straight front, recessed, 60 x 30 x 14 in, porcelain enameled cast iron with structural composite reinforcement ASME A112.19.4M. Color shall be white. Tub shall be American Standard "Princeton", or approved equal in function, style and appearance.

Drain Assembly - Plug, cup strainer, overflow assembly, washers, couplings, pop-up lever, trip lever, stopper, fittings, etc., shall be brass, cast copper alloy, or wrought copper alloy.

Bath Showers: Bath showers shall include bathtub spout, shower head, valves, diverters. A shower head mounting with ball joint and head integral with a formed wall plate shall be provided. Diverter shall be integral with single mixing valve. Mixing valve shall be a pressure-balancing type lever operated valve which shall maintain water temperature to within +/- 5F. Finish shall be chrome plate. Tub spout shall be copper alloy, chrome plate. Unit shall be Delta 1343, or approved equal in function, style and appearance.

P-8 Washer Box:

Clothes Washer: Drainage and hot and cold water supply shall be provided for automatic clothes washers. Washer connection, complete with 2-inch drain, 3/4-inch hose thread supplies shall be provided in standard manufactured recessed wall box with single-face plate. Boxes shall be constructed of pre-molded plastic. Boxes shall be mounted a minimum of 2 ft-10 inches above the finish floor. Electrical outlets for both washer and dryer shall not be installed as an integral part of the box but shall also be provided.

P-9 Refrigerator Ice Maker:

Cold water supply shall be provided for GF refrigerator ice makers. Ice maker connection shall include an angle valve and a 1/4 inch hose thread supply, and shall be provided in standard manufactured recessed wall box with single-face plate (plastic or steel). Boxes shall be mounted a minimum 2 ft-10 inches above the finish floor

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P-10 GARBAGE DISPOSAL MACHINES:

Garbage disposals machines shall be in accordance with CID A-A-50012. Garbage disposals shall be provided in each kitchen sink. Garbage disposals shall be provided with an integral connection for the dishwasher

drai:3.8 TABLES

TABLE I
PIPE AND FITTING MATERIALS FOR
DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

		SERVICE			
Item #	Pipe and Fitting Materials	A	B	C	D
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A 74 with compression gaskets	X	X	X	X
2	Cast iron soil pipe and fittings hubless, CISPI 301 and ASTM A 888		X	X	X
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X	X
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10				X
9	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10				X
10	Steel pipe, seamless galvanized, ASTM A 53/A 53M, Type S, Grade B	X			X
11	Seamless red brass pipe, ASTM B 43		X		
12	Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14				X
13	Cast copper alloy solder joint pressure fittings, ASME B16.18				X
15	Cast bronze threaded fittings, ASME B16.15				X
16	Copper drainage tube, (DWV), ASTM B 306	X*	X	X*	X
17	Wrought copper and wrought alloy solder-joint drainage fittings. ASME B16.29	X	X	X	X
18	Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23	X	X	X	X
19	Acrylonitrile-Butadiene-Styrene (ABS) plastic drain, waste, and vent pipe	X	X	X	X

TABLE I
PIPE AND FITTING MATERIALS FOR
DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

		SERVICE			
Item #	Pipe and Fitting Materials	A	B	C	D
	and fittings ASTM D 2661, ASTM F 628				
20	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D 2665, ASTM F 891, (Sch 40) ASTM F 1760	X	X	X	X

SERVICE:

- A - Underground Building Soil, Waste and Storm Drain
- B - Aboveground Soil, Waste, Drain In Buildings
- C - Underground Vent
- D - Aboveground Vent
- * - Hard Temper

TABLE II
PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE		
		A	B	
6	Bronze flanged fittings, ASME B16.24	X	X	X
7	Seamless copper pipe, ASTM B 42	X	X	
8	Seamless copper water tube, ASTM B 88, ASTM B 88M	X**	X**	
9	Cast bronze threaded fittings, ASME B16.15 for use with Items 5 and 7	X	X	X
10	Wrought copper and bronze solder-joint pressure fittings, ASME B16.22 for	X	X	
11	Cast copper alloy solder-joint pressure fittings, ASME B16.18 for use with Items 8 and 9	X	X	
36	Nipples, pipe threaded ASTM A 733	X	X	X

A - Cold Water Aboveground

B - Hot Water 180 degrees F Maximum Aboveground

D - Cold Water Service Belowground

Indicated types are minimum wall thicknesses.

** - Type L - Hard

*** - Type K - Hard temper with brazed joints only or type K-soft temper
without joints in or under floors

**** - In or under slab floors only brazed joints

SECTION 15566A

WARM AIR HEATING SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.47 (1998) Gas-Fired Furnaces

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M (2001) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 653/A 653M (2000) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B 117 (1997) Operating Salt Spray (Fog) Apparatus

ASTM D 1654 (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 1784 (1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D 3359 (1997) Measuring Adhesion by Tape Test

ASTM D 520 (2000) Zinc Dust Pigment

INTERNATIONAL APPROVAL SERVICES (IAS)

IAS Directory (1998) IAS Directory of AGA & CGA Certified Appliances and Accessories

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (1998) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211 (2000) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

NFPA 54 (1999) National Fuel Gas Code

NFPA 90A (1999) Installation of Air Conditioning and

Ventilating Systems

NFPA 90B

(1999) Installation of Warm Air Heating and Air Conditioning Systems

UNDERWRITERS LABORATORIES (UL)

UL 1738

(1993; Rev thru Mar 1998) Venting Systems for Gas-Burning Appliances, Categories II, III and IV

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Heating Equipment; G, ED
Installation

Drawings shall consist of a complete list of equipment and material including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Drawings shall contain complete equipment wiring diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenance and equipment relationship to other parts of the work including clearances required for maintenance and operation.

SD-03 Product Data

Heating Equipment; G

Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than 6 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 12 months operation, and a list of the parts recommended by the manufacturer to be replaced after 1 and 3 year(s) of service.

Tests;

Proposed test procedures for ductwork leak and performance tests, at least 2 weeks prior to the start of related testing.

Proposed test schedules for ductwork leak test and performance tests, at least 2 weeks prior to the start of related testing.

System Diagrams

Proposed diagrams, at least 2 weeks prior to start of related testing. System diagrams that show the layout of equipment and

ductwork, and typed condensed operation manuals explaining preventative maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed.

Similar Services;

Statement demonstrating successful completion of similar services on at least 5 projects of similar size and scope, at least 2 weeks prior to submittal of other items required by this section.

Field Training;

Proposed schedule for field training, at least 2 weeks prior to the start of related training.

SD-10 Operation and Maintenance Data

Heating Equipment;

Six manuals listing step-by-step procedures required for system startup, operation, shutdown and routine maintenance, at least 2 weeks prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tool that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment.

1.3 GENERAL REQUIREMENTS

1.3.1 Standard Products

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.3.2 Nameplates

Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

1.3.3 Verification of Dimensions

After becoming familiar with all details of the work and working conditions, the Contractor shall verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing any work.

1.4 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or

other contaminants.

1.5 ELECTRICAL WORK

Electrical motor-driven equipment specified shall be provided complete with motor, motor starter, and controls. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Electrical characteristics and enclosure type shall be as shown. Unless otherwise indicated, motors of 1 hp and above shall be high efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall be in accordance with NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices, but not shown, shall be provided. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controller may be provided to accomplish the same function. Solid-state variable-speed controllers shall be utilized for motors rated 10 hp or less. Adjustable frequency drives shall be used for larger motors.

PART 2 PRODUCTS

2.1 SELF-CONTAINED FURNACE

Furnace shall be a manufacturer's standard, self-contained, forced circulated air heating type furnace as indicated. Furnace and furnace components shall be completely factory-assembled and wired. Furnace casing shall be factory insulated and be compatible with the operating temperatures. Furnace shall be provided with removable service panels which allow access to all internal components requiring cleaning, servicing, or adjustment.

2.1.1 Gas-Fired Unit

Gas-fired furnace shall be the high efficiency, condensing type in accordance with ANSI Z21.47. Furnace design shall be certified by the AMERICAN GAS ASSOCIATION LABORATORIES (AGA). Furnace shall have a minimum certified Annual Fuel Utilization Efficiency (AFUE) of not less than 90 percent.

2.2 FURNACE COMPONENTS

2.2.1 Gas-Burning Components

Gas-burning equipment shall include the gas burners, ignition equipment, gas-control valve, gas piping, gas-pressure regulating valve, when applicable, and accessories necessary for a fully automatic system that is listed in IAS Directory. Gas-fired units equipped with programming controls shall be furnished both with high and with low gas supply pressure switches in the fuel supply piping.

2.2.2 Ignition Systems

2.2.2.1 Gas-Fired Units

Ignition systems shall be of the direct spark, hot surface, or interrupted intermittent type with automatic electric ignition. The pilots shall be of

the electrically-ignited proven type. Continuous pilots will not be permitted. Burner shall be designed in accordance with NFPA 54 and located so that parts are protected against overheating. Provisions shall be made in the burner housing for inspection of the pilot flame.

2.2.3 Supply Blowers

Blowers shall be centrifugal type. Blowers shall be statically and dynamically balanced. Lubrication points shall be located or extended, as required, to provide ready access for periodic lubrication. The direction of rotation shall be clearly and permanently marked on each blower housing. Blower speeds shall be single, or multispeed, as indicated, to provide the specified range of air temperature rises. Direct-drive blowers may have multiple speed motors to change blower speed. Belt-drive blowers shall be provided with an adjustable base and guard or enclosed in the unit casing. The belt drive shall be designed in accordance with the applicable Rubber Manufacturer's Association (RMA) power transmission belt specifications, with a service factor of at least 1.2. Shafts shall be supported by a minimum of two self-aligning bearings. Blower speed shall be adjusted by the use of variable pitch drive sheaves.

2.2.4 Vents for High Efficiency Furnaces

Powered direct venting shall be used for condensing type furnaces. Both the air intake and exhaust vents shall be sized and located as indicated on the drawings and as recommended by the furnace manufacturer. A separate combustion air intake vent and exhaust shall be provided for each furnace. Plastic materials polyetherimide (PEI) and polyethersulfone (PES) are forbidden to be used for vent piping of combustion gases.

2.2.4.1 Combustion Air Intake Vent

The combustion air intake piping shall be constructed of Schedule 40 PVC in accordance with ASTM D 1784. The vent shall be suitable for the temperature at the furnace combustion air intake connection point. Each intake shall be provided complete with bird screen.

2.2.4.2 Exhaust Vent

The exhaust vent piping shall be constructed of Schedule 40 CPVC or stainless steel in accordance with UL 1738 and the furnace manufacturer's recommendations. The exhaust vent shall be suitable for the maximum anticipated furnace exhaust temperature and shall withstand the corrosive effects of the condensate. A 0.3125 inch diameter hole shall be provided in the stack not greater than 6 inches from the furnace flue outlet for sampling of the exit gases. A method shall be provided to seal the hole to prevent exhaust gases from entering the indoor space when samples are not being taken. Each exhaust stack shall be provided complete with bird screen.

2.3 AIR CONDITIONING EQUIPMENT

Cooling coils, condensers and related equipment shall be as specified in Section 15700A AIR CONDITIONING SYSTEM.

2.4 CONTROLS

Furnace controls shall be provided by the furnace manufacturer as an integral part of the furnace. Electronic controls shall be provided. The

controls shall allow for single stage operation.

2.5 FUEL-GAS SUPPLY SYSTEM

Fuel-gas supply system shall be as specified in Section 15190A GAS PIPING SYSTEMS and Section 02556A GAS DISTRIBUTION SYSTEM.

2.6 DUCTWORK COMPONENTS

2.6.1 Metal Ductwork

All aspects of metal ductwork construction, including all fittings and components, shall be as specified in Section 15895A, AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS.

2.7 FACTORY PAINTING

Units which are not of galvanized construction according to ASTM A 123/A 123M or ASTM A 653/A 653M shall be factory painted with a corrosion resisting paint finish, unless otherwise noted. Internal and external ferrous metal surfaces shall be cleaned, phosphated and coated with a paint finish which has been tested according to ASTM B 117, ASTM D 1654, and ASTM D 3359. Evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors shall be submitted. Rating of failure at the scribe mark shall be not less than 6, average creepage not greater than 10, no failure. On units constructed of galvanized steel which have been welded, exterior surfaces of welds or welds that have burned through from the interior shall receive a final shop docket of zinc-rich protective paint in accordance with ASTM D 520, Type I.

PART 3 EXECUTION

3.1 INSTALLATION

The warm air heating installation shall conform to the requirements contained in NFPA 90A or NFPA 90B, as applicable. Combustion air supply and ventilation shall be in accordance with NFPA 54.

3.1.1 Furnaces

Foundations, settings, or suspensions for mounting equipment and accessories including supports, vibration isolators, stands, guides, anchors, clamps, and brackets shall be provided. Foundations and suspension for equipment shall conform to the recommendations of the manufacturer. Equipment shall be located as indicated and in such a manner that working space is available for all necessary servicing, such as shaft removal, replacing, or adjusting drives, motors, or shaft seals, air filters, access to automatic controls, humidifiers, and lubrication. Electrical isolation shall be provided between dissimilar metals for the purpose of minimizing galvanic corrosion. The interior of cabinets or casings shall be cleaned before completion of installation. The furnace shall be connected to the vent or chimney with the specified connectors, draft regulators, draft loads, and induced draft fans, as applicable, in accordance with NFPA 211.

3.1.2 Access Panels

Access panels shall be provided for concealed valves, vents, controls,

dampers, and items requiring inspection or maintenance. Access panels shall be of sufficient size and so located that the concealed items may be serviced and maintained or completely removed for replacement. Access panels shall be as specified in Section 05500A MISCELLANEOUS METAL.

3.1.3 Flexible Connectors

Pre-insulated flexible connectors and flexible duct shall be attached to other components in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the connector or duct manufacturer and shall be provided at the intervals recommended.

3.1.4 Sleeved and Framed Openings

Space between the sleeved or framed opening and the duct or the duct insulation shall be packed as specified in Section 07840A FIRESTOPPING for fire rated penetrations. For non-fire rated penetrations, the space shall be packed as specified in Section 07900A JOINT SEALING.

3.1.5 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, temporary dust control protection shall be provided. The distribution system (supply and return) shall be protected with temporary seal-offs at all inlets and outlets at the end of each day's work. Temporary protection shall remain in place until system is ready for startup.

3.1.6 Insulation

Thickness and application of insulation materials for ductwork and equipment shall be in accordance with Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.2 FIELD PAINTING

Finish painting of pipes, hangers, supports and items only primed at the factory or surfaces not specifically noted, otherwise are specified in Section 09900 PAINTING, GENERAL.

3.3 CLEANING

Ducts, plenums, and casings shall be thoroughly cleaned of all debris and blown free of all small particles of rubbish and dust and then shall be vacuum cleaned before installing outlet faces. Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided prior to startup of all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building, and the ducts, plenums, casings, and other items specified have been vacuum cleaned. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. All equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

3.4 TESTS

Upon completion and prior to acceptance of the installation, the Contractor shall furnish all equipment, instruments, materials, labor, and supervision required for the tests as specified. Water, electricity, and fuel required for testing shall will be furnished by the Government. Defects disclosed by the tests shall be rectified. Tests shall be made under the direction and subject to the approval of the Contracting Officer. All indicating instruments shall be read at 1/2-hour intervals unless otherwise directed by the Contracting Officer.

3.4.1 Testing, Adjusting, and Balancing

Testing, adjusting, and balancing shall be as specified in Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS. Testing, adjusting, and balancing shall begin only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

3.4.2 Performance Tests

After testing, adjusting, and balancing has been completed as specified, each system shall be tested as a whole to see all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Corrections and adjustments shall be conducted by an experienced engineer. Tests shall cover a period of not less than 5 days for each system and shall demonstrate that the entire system is functioning according to the specifications. Coincidental chart recordings shall be made at points indicated on the drawings for the duration of the time period and shall record the temperature at space thermostats or space sensors, the humidity in a shaded and weather protected area.

3.5 FIELD TRAINING

The Contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 4 hours of normal working time shall start after the system is functionally complete but prior to the performance tests. The field instruction shall cover all of the items contained in the approved operating and maintenance instructions.

-- End of Section --

SECTION 15700A

AIR-CONDITIONING SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

- | | |
|---------|--|
| ARI 270 | (1995) Sound Rating of Outdoor Unitary Equipment |
| ARI 460 | (2000) Remote Mechanical-Draft Air-Cooled Refrigerant Condensers |
| ARI 700 | (1999) Specifications for Fluorocarbon and Other Refrigerants |

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

- | | |
|-----------|---|
| ASHRAE 15 | (1994) Safety Code for Mechanical Refrigeration |
| ASHRAE 34 | (1997) Number Designation and Safety Classification of Refrigerants |

AMERICAN WELDING SOCIETY (AWS)

- | | |
|-----------|--------------------------------------|
| AWS Z49.1 | (1999) Safety in Welding and Cutting |
|-----------|--------------------------------------|

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- | | |
|-----------|--|
| NEMA MG 1 | (1998) Motors and Generators |
| NEMA MG 2 | (1989) Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators |

UNDERWRITERS LABORATORIES (UL)

- | | |
|---------|---|
| UL 1995 | (1995; Rev thru Aug 1999) Heating and Cooling Equipment |
|---------|---|

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be

submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings; G

Drawings shall provide adequate detail to demonstrate compliance with contract requirements. Drawings shall consist of:

- a. Equipment layouts which identify assembly and installation details.
- b. Plans and elevations which identify clearances required for maintenance and operation.
- c. Wiring diagrams which identify each component individually and interconnected or interlocked relationships between components.
- d. Piping layouts which identify valves and fittings.

SD-03 Product Data

Air Conditioning System; G

Manufacturer's standard catalog data, at least 5 weeks prior to the purchase or installation of a particular component, highlighted to show material, size, options, performance charts and curves, etc. in adequate detail to demonstrate compliance with contract requirements. Data shall include manufacturer's recommended installation instructions and procedures. If vibration isolation is specified for a unit, vibration isolator literature shall be included containing catalog cuts and certification that the isolation characteristics of the isolators provided meet the manufacturer's recommendations. Data shall be submitted for each specified component.

Spare Parts Data;

Spare parts data for each different item of equipment specified, after approval of detail drawings and not later than 6 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.

Posted Instructions;

Posted instructions, at least 2 weeks prior to construction completion, including equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The posted instructions shall be framed under glass or laminated plastic and be posted where indicated by the Contracting Officer.

Verification of Dimensions;

A letter, at least 2 weeks prior to beginning construction,

including the date the site was visited, conformation of existing conditions, and any discrepancies found.

SD-06 Test Reports

Refrigerant Tests, Charging, and Start-Up

Six copies of each test containing the information described below in bound 8-1/2 x 11 inch booklets. Individual reports shall be submitted for the refrigerant system tests.

- a. The date the tests were performed.
- b. A list of equipment used, with calibration certifications.
- c. Initial test summaries.
- d. Repairs/adjustments performed.
- e. Final test results.

System Performance Tests

Six copies of the report provided in bound 8-1/2 x 11 inch booklets. The report shall document compliance with the specified performance criteria upon completion and testing of the system. The report shall indicate the number of days covered by the tests and any conclusions as to the adequacy of the system. The report shall also include the following information and shall be taken at least three different times at outside dry-bulb temperatures that are at least 5 degrees F apart:

- a. Date and outside weather conditions.
- b. The load on the system based on the following:
 - (1) The refrigerant used in the system.
 - (2) Condensing temperature and pressure.
 - (3) Suction temperature and pressure.
 - (4) Ambient, condensing and coolant temperatures.
 - (5) Running current, voltage and proper phase sequence for each phase of all motors.
- k. Field data and adjustments which affect unit performance and energy consumption.
- l. Field adjustments and settings which were not permanently marked as an integral part of a device.

SD-07 Certificates

Air Conditioning;

Where the system, components, or equipment are specified to comply with requirements of ARI, ASHRAE, ASME, or UL, proof of such compliance shall be provided. The label or listing of the specified agency shall be acceptable evidence. In lieu of the label or listing, a written certificate from an approved, nationally recognized testing organization equipped to perform such

services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency may be submitted. When performance requirements of this project's drawings and specifications vary from standard ARI rating conditions, computer printouts, catalog, or other application data certified by ARI or a nationally recognized laboratory as described above shall be included. If ARI does not have a current certification program that encompasses such application data, the manufacturer may self certify that his application data complies with project performance requirements in accordance with the specified test standards.

Service Organization;

A certified list of qualified permanent service organizations, which includes their addresses and qualifications, for support of the equipment. The service organizations shall be reasonably convenient to the equipment installation and be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

SD-10 Operation and Maintenance Data

Operation Manuals;

Six complete copies of an operation manual in bound 8 1/2 x 11 inch booklets listing step-by-step procedures required for system startup, operation, abnormal shutdown, emergency shutdown, and normal shutdown at least 4 weeks prior to the first training course. The booklets shall include the manufacturer's name, model number, and parts list. The manuals shall include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features.

Maintenance Manuals;

Six complete copies of maintenance manual in bound 8-1/2 x 11 inch booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals shall include piping and equipment layouts and simplified wiring and control diagrams of the system as installed.

1.3 SAFETY REQUIREMENTS

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices shall be installed so that proper operation of equipment is not impaired. Welding and cutting safety requirements shall be in accordance with AWS Z49.1.

1.4 DELIVERY, STORAGE, AND HANDLING

Stored items shall be protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material both before and during installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

1.5 PROJECT/SITE CONDITIONS

1.5.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.5.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the plumbing, fire protection, electrical, structural and finish conditions that would affect the work to be performed and arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions.

PART 2 PRODUCTS

2.1 STANDARD COMMERCIAL PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record shall be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Products shall be supported by a service organization. System components shall be environmentally suitable for the indicated locations.

2.2 NAMEPLATES

Major equipment including compressors, condensers shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment. Plates shall be durable and legible throughout equipment life and made of anodized or aluminum stainless steel. Plates shall be fixed in prominent locations with nonferrous screws or bolts.

2.3 ELECTRICAL WORK

Electrical equipment, motors, motor efficiencies, and wiring shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls. Electrical characteristics shall be as shown, and unless otherwise indicated, all motors of 1 horsepower and above with open, dripproof, totally enclosed, or explosion proof fan cooled enclosures, shall be high efficiency type. Field wiring shall be in accordance with manufacturer's instructions. Each motor shall conform to NEMA MG 1 and NEMA MG 2 and be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Motors shall be continuous duty with the enclosure specified. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control indicated. Motors shall be furnished with a magnetic across-the-line or reduced voltage type starter as required by

the manufacturer. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motors shall be sized for the applicable loads. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings shall be fitted with grease supply fittings and grease relief to outside of enclosure. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided.

2.4 SPLIT SYSTEM WITH REMOTE CONDENSING UNIT

Units shall produce a maximum ARI sound rating of 8 bels when rated in accordance with ARI 270. Saturated refrigerant condensing temperature shall not exceed 120 degrees F at 95 degrees F ambient. Fan and condenser motors shall have drip-proof enclosures.

2.4.1 Air-Cooled Condenser

Unit shall be rated in accordance with ARI 460 and conform to the requirements of UL 1995. Unit shall be factory fabricated, tested, packaged, and self-contained. Unit shall be complete with casing, compressor, propeller or centrifugal type fans, heat rejection coils, connecting piping and wiring, and all necessary appurtenances.

2.4.1.1 Connections

Interconnecting refrigeration piping, electrical power, and control wiring between the condensing unit and the indoor unit shall be provided as required and as indicated. Electrical and refrigeration piping terminal connections between condensing unit and evaporator units shall be provided.

2.4.1.2 Condensing Coil

Coils shall have copper tubes of 3/8 inch minimum diameter with copper or aluminum fins that are mechanically bonded or soldered to the tubes. Contact of dissimilar metals shall be avoided. Coils shall be tested in accordance with ASHRAE 15 at the factory and be suitable for the working pressure of the installed system. Each coil shall be dehydrated and sealed after testing and prior to evaluation and charging. Each unit shall be provided with a factory operating charge of refrigerant and oil or a holding charge. Unit shipped with a holding charge shall be field charged.

2.4.1.3 Fan Section

Fan shall be the propeller type. Motors shall have splashproof enclosure and be suitable for the indicated service. The condensing unit design shall prevent water from entering into the fan section.

2.4.1.4 Compressor

Compressor shall be direct drive, semi-hermetic or hermetic reciprocating, or scroll type capable of operating at all load conditions. Compressor shall be capable of continuous operations. Each compressor shall be provided with vibration isolators, crankcase heater, thermal overloads, and high and low pressure safety cutoffs and protection against short cycling.

2.4.1.5 Evaporator Coil

Coils shall have copper tubes of 3/8 inch minimum diameter without fins. Contact of dissimilar metals shall be avoided. Coils shall be tested in accordance with ASHRAE 15 at the factory and be suitable for the working pressure of the installed system. Each coil shall be dehydrated and sealed after testing and prior to evaluation and charging. Each unit shall be provided with a factory operating charge of refrigerant and oil or a holding charge. Unit shipped with a holding charge shall be field charged.

Coil shall be encased in an insulated coil casing, complete with condensate drain pan, and all necessary items for complete operation. Unit shall be suitably designed to fit atop the furnace selected for installation.

2.5 SYSTEM COMPONENTS

2.5.1 Refrigerant and Oil

Refrigerant shall be one of the fluorocarbon gases. Refrigerants shall have number designations and safety classifications in accordance with ASHRAE 34. Refrigerants shall meet the requirements of ARI 700 as a minimum. Refrigerants shall have an Ozone Depletion Potential (ODP) of less than or equal to 0.05. Contractor shall provide and install a complete charge of refrigerant for the installed system as recommended by the manufacturer. Two complete charges of lubricating oil for each compressor crankcase shall be furnished. One charge shall be used during the system performance testing period. Following the satisfactory completion of the performance testing, the oil shall be drained and replaced with a second charge. Lubricating oil shall be of a type and grade recommended by the manufacturer for each compressor. Where color leak indicator dye is incorporated, charge shall be in accordance with manufacturer's recommendation.

2.6 REFRIGERANT PIPING

Refrigerant piping, valves, fittings, and accessories shall conform to the requirements of ASHRAE 15 and ASME B31.5, except as specified.

2.6.1 Copper Tubing

Copper tubing shall conform to ASTM B 280 annealed or hard drawn as required. Copper tubing shall be soft annealed where bending is required and hard drawn where no bending is required. Soft annealed copper tubing shall not be used in sizes larger than 1-3/8 inches. Joints shall be brazed except that joints on line 7/8 inch and smaller may be flared.

2.6.2 Joints and Fittings, Copper Tubing

Copper tube joints and fittings shall be flare joint type with short-shank flare, or solder-joint pressure type. Joints and fittings for brazed joint shall be wrought-copper or forged-brass sweat fittings. Cast sweat-type joints and fittings shall not be allowed for brazed joints.

2.6.3 Valves

Valves shall be pressure and temperature rated for contained refrigerant services and shall comply with ASME B31.5. Metals of construction shall be ferrous or copper based. Atmosphere exposed valve stems shall be stainless steel or corrosion resistant metal plated carbon steel. Valve body

connections shall be brazed or welded socket, flanged or combination thereof. Threaded connections shall not be used, except in pilot pressure or gauge lines where maintenance disassembly is required and welded flanges cannot be used. Valves shall be suitable for or fitted with extended copper ends for brazing in-place without disassembly. Ferrous body valves shall be fitted with factory fabricated and brazed copper transitions. To minimize system pressure drops, where practicable, globe valves shall be angle body type, and straight line valves shall be full port ball type. Control valve inlets shall be fitted with integral or adapted strainer or filter where recommended or required by manufacturer. Valves shall be cleaned and sealed moisture-tight.

2.6.3.1 Refrigerant-Stop Valves

Valves, in sizes through 5/8 inch, shall be handwheel operated, straight or angle, packless diaphragm globe type with back-seating stem, brazed ends, except where SAE flare or retained seal cap connections are required. In sizes over 5/8 inch, valves shall be globe or angle type, wrench operated with ground-finish stems, or ball valves, packed especially for refrigerant service, back seated, and provided with seal caps. Refrigerant isolation and shut-off valves shall have retained or captive spindles and facilities for tightening or replacement of the gland packing under line pressure as applicable. Stop valves shall have back-seating plated steel stem, bolted bonnet in sizes 1-1/8 inches OD and larger, integral or flanged transition brazed socket. Valves in size through 2-2/2 inches shall be end-entry body assembly, full-port, floating ball type, with equalizing orifice fitted chrome plated or stainless steel stem, and seal cap. In sizes 4 inch IPS and larger, and in smaller sizes where carbon steel piping is used, valve bodies shall be tongue and groove flanged and complete with mating flange, gaskets and bolting for socket or butt-weld connection. Purge, charge and receiver valves shall be of manufacturer's standard configuration.

2.6.3.2 Liquid Solenoid Valves

Valves shall comply with ARI 760 and be suitable for continuous duty with applied voltages 15 percent under and 5 percent over nominal rated voltage at maximum and minimum encountered pressure and temperature service conditions. Valves shall be direct-acting or pilot-operating type, packless, except that packed stem, seal capped, manual lifting provisions shall be furnished. Solenoid coils shall be moisture-proof, UL approved, totally encapsulated or encapsulated and metal jacketed as required. Valves shall have safe working pressure of 400 psi and a maximum operating pressure differential of at least 200 psi at 85 percent rated voltage. Valves shall have an operating pressure differential suitable for the refrigerant used.

2.6.3.3 Expansion Valves

Expansion valves conform to requirements of ARI 750. Valve shall be of the diaphragm and spring type with internal or external equalizers, and bulb and capillary tubing. Valve shall be provided with an external superheat adjustment along with a seal cap. Internal equalizers may be utilized where flowing refrigerant pressure drop between outlet of the valve and inlet to the evaporator coil is negligible and pressure drop across the evaporator is less than the pressure difference corresponding to 2 degrees F of saturated suction temperature at evaporator conditions. Bulb charge shall be determined by the manufacturer at evaporator conditions. Gas limited liquid charged valves and other valve devices for limiting evaporator pressure shall not be used without a distributor or discharge

tube or effective means to prevent loss of control when bulb becomes warmer than valve body. Pilot-operated valves shall have a characterized plug to provide required modulating control. A de-energized solenoid valve may be used in the pilot line to close the main valve in lieu of a solenoid valve in the main liquid line. An isolatable pressure gauge shall be provided in the pilot line, at the main valve. Automatic pressure reducing or constant pressure regulating expansion valves may be used only where indicated or for constant evaporator loads.

2.6.4 ACCESSORIES

2.6.4.1 Filter Driers

Driers shall conform to ARI 710. Sizes 5/8 inch and larger shall be the full flow, replaceable core type. Sizes 1/2 inch and smaller shall be the sealed type. Cores shall be of suitable desiccant that will not plug, cake, dust, channel, or break down, and shall remove water, acid, and foreign material from the refrigerant. Filter driers shall be constructed so that none of the desiccant will pass into the refrigerant lines. Minimum bursting pressure shall be 1,500 psi.

2.6.4.2 Sight Glass and Liquid Level Indicator

a. Assembly and Components: Assembly shall be pressure- and temperature-rated and constructed of materials suitable for the service. Glass shall be borosilicate type. Ferrous components subject to condensation shall be electro-galvanized.

2.6.4.3 Brazing Materials

Brazing materials for refrigerant piping shall be in accordance with AWS A5.8, Classification BCuP-5.

2.7 DRAIN AND MISCELLANEOUS PIPING

Piping, fittings, valves and accessories for drain and miscellaneous services shall be in accordance with Section 15400 PUMING, GENERAL PURPOSE.

2.8 FACTORY COATING

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard finish, except that items located outside of buildings shall have weather resistant finishes that will withstand 500 hours exposure to the salt spray test specified in ASTM B 117 using a 25 percent sodium chloride solution. Immediately after completion of the test, the specimen shall show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used shall be coated with a zinc-rich coating conforming to ASTM D 520 Type I.

2.8.1 FIELD PAINTING

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in SECTION 09900 PAINTING.

2.9 MISCELLANEOUS MATERIALS

2.9.1 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.9.2 Escutcheons

Escutcheons shall be chromium-plated iron or chromium-plated brass, either one piece ore split pattern, held in place by internal spring tension or set screws.

PART 3 EXECUTION

3.1 INSTALLATION

Work shall be performed in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements.

3.1.1 Equipment

Refrigeration equipment and the installation thereof shall conform to ASHRAE 15. Necessary supports shall be provided for all equipment, appurtenances, and pipe as required, including frames or supports for compressors, condensers, and similar items. Compressors shall be isolated from the building structure. Equipment shall be properly leveled, aligned, and secured in place in accordance with manufacturer's instructions.

3.1.2 Field Applied Insulation

Field applied insulation shall be as specified in Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS, except as defined differently herein.

3.1.3 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in Section 09900 PAINTING, GENERAL.

3.1.4 Building Surface Penetrations

3.1.4.1 Fire-Rated Penetration

Penetration of fire-rated walls, partitions, and floors shall be sealed as specified in Section 07840 FIRESTOPPING.

3.1.5 General Piping Installation

3.1.5.1 Brazed Joints

Brazing shall be performed in accordance with AWS Brazing Hdbk, except as modified herein. During brazing, the pipe and fittings shall be filled with a pressure regulated inert gas, such as nitrogen, to prevent the formation of scale. Before brazing copper joints, both the outside of the tube and the inside of the fitting shall be cleaned with a wire fitting brush until the entire joint surface is bright and clean. Brazing flux shall not be used. Surplus brazing material shall be removed at all joints. Steel tubing joints shall be made in accordance with the manufacturer's recommendations. Joints in steel tubing shall be painted with the same material as the bake-on coating within 8 hours after joints are made. Tubing shall be protected against oxidation during brazing by continuous purging of the inside of the piping using nitrogen. Piping shall be supported prior to brazing and not be sprung or forced.

3.1.5.2 Flared Connections

When flared connections are used, a suitable lubricant shall be used between the back of the flare and the nut in order to avoid tearing the flare while tightening the nut.

3.1.5.3 Directional Changes

Changes in direction shall be made with fittings, except that bending of pipe 4 inches or smaller will be permitted, provided a pipe bender is used and wide weep bends are formed. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be accepted.

3.1.6 Refrigerant Piping

3.1.6.1 Filter Dryer

A liquid line filter dryer shall be provided on each refrigerant circuit located such that all liquid refrigerant passes through a filter dryer. Dryers shall be sized in accordance with the manufacturer's recommendations. A dryer shall be installed such that it can be isolated from the system, the isolated portion of the system evacuated, and the filter dryer replaced. Dryers shall be installed in the horizontal position except replaceable core filter dryers may be installed in the vertical position with access flange on the bottom.

3.1.6.2 Sight Glass

A moisture indicating sight glass shall be installed in all refrigerant circuits down stream of filter dryers and where indicated. Sight glass shall be full line size.

3.1.7 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein. Pipe hanger types 5, 12, and 26 shall not be used.

3.1.8 Framed Instructions

Framed instructions shall be framed under glass or laminated plastic and be posted where directed. Instructions shall include equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The instructions shall be posted before acceptance testing of the system.

3.2 CLEANING AND ADJUSTING

Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions. Testing, adjusting, and balancing shall be as specified in Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

3.3 TESTS

Test shall be conducted in the presence of the Contracting Officer. Utilities for testing shall be provided as specified in the SPECIAL CONTRACT REQUIREMENTS. Water and electricity required for the tests will be furnished by the Government. Any material, equipment, instruments, and personnel required for the test shall be provided by the Contractor. The services of the a qualified technician shall be provided as required to perform all tests and procedures indicated herein. Field tests shall be coordinates with Section 15990 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

3.3.1 Refrigerant System

After all components of the refrigerant system have been installed and connected, the entire refrigeration system shall be subjected to an pneumatic test as described herein.

3.3.1.1 Preliminary Procedures

Prior to pneumatic testing, equipment which has been factory tested and refrigerant charged as well as equipment which could be damaged or cause personnel injury by imposed test pressure, positive or negative, shall be isolated from the test pressure or removed from the system. Safety relief valves and rupture discs, where not part of factory sealed systems, shall be removed and openings capped or plugged.

3.3.1.2 Pneumatic Test

Pressure control and excess pressure protection shall be provided at the source of test pressure. Valves shall be wide open, except those leading

to the atmosphere. Test gas shall be dry nitrogen, with minus 70 degrees F dewpoint and less than 5 ppm oil. Test pressure shall be applied in two stages before any refrigerant pipe is insulated or covered. First stage test shall be at 10 psi with every joint being tested with a thick soap or color indicating solution. Second stage test shall be raise the system to the minimum refrigerant leakage test pressure specified in ASHRAE 15 with a maximum test pressure 25 percent greater. Pressure above 100 psig shall be raised in 10 percent increments with a pressure acclimatizing period between increments. The initial test pressure shall be recorded along with the ambient temperature to which the system is exposed. Final test pressure of the second stage shall be maintained on the system for a minimum of 24 hours. At the end of the 24 hour period, the system pressure will be recorded along with the ambient temperature to which the system is exposed. A correction factor of 0.3 psi will be allowed for each degree F change between test space initial and final ambient temperature, plus for increase and minus for a decrease. If the corrected system pressure is not exactly equal to the initial system test pressure, then the system shall be investigated for leaking joints. To repair leaks, the joint shall be taken apart, thoroughly cleaned, and reconstructed as a new joint. Joints repaired by caulking, remelting, or back-welding/brazing shall not be acceptable. Following repair, the entire system shall be retested using the pneumatic tests described above. The entire system shall be reassembled once the pneumatic tests are satisfactorily completed.

3.3.1.3 Evacuation Test

Following satisfactory completion of the pneumatic tests, the pressure shall be relieved and the entire system shall be evacuated to an absolute pressure of 300 micrometers. During evacuation of the sytem, the ambient temperature shall be higher than 35 degrees F. No more than one system shall be evacuated at aon time by one vacuum pump. Once the desire vacuum has been reached, the vacuum line shall be closed and the system shall stand for 1 hour. If the pressure rises over 500 micrometers after the 1 hour period, then the system shall be evacuated again down to 300 micrometers and let set for another 1 hour period. The system shall not be charged until a vacuum of at least 500 micrometers is maintained for a period of 1 hour without the assistance of a vacuum line. If during the testing the pressure continues to rise, check the system for leaks, repair as required, and repeat the evacuation procedure. During evacuation, pressure shall be recored by a thermocouple-type, electronic-type, or a calibrated-micrometer-type gauge.

3.3.1.4 System Charging andStartup Test

Following satisfactory completion of the evacuation tests, the system shall be charged with the required amount of refrigerant by raising pressure to normal operating pressure and in accordance with manufacturer's procedures.

Following charging, the system shall operate with high-side and low-side pressures and corresponding refrigerant temperatures, at design or improved values. The entire system shall be tested for leaks. Fluorocarbon systems shall be tested with halide torch or electronic leak detectors.

3.3.1.5 Refrigerant Leakage

If a refrigerant leak is discovered after the system has been charged, the leaking portion of the system shall immediately be isolated from the remainder of the system and the refrigerant pumped into the system receiver or other suitable container. Under no circumstances shall the refrigerant be discharged into the atmosphere.

3.3.1.6 Contractor's Responsibility

The Contractor shall, at all times during the installation and testing of the refrigeration system, take steps to prevent the release of refrigerants into the atmosphere. The steps shall include, but not be limited to, procedures which will minimize the release of refrigerants to the atmosphere and the use of refrigerant recovery devices to remove refrigerant from the system and store the refrigerant for reuse or reclaim.

At no time shall more than 3 ounces of refrigerant be released to the atmosphere in any one occurrence. Any system leaks within the first year shall be repaired in accordance with the requirements herein at no cost to the Government including material, labor, and refrigerant if the leak is the result of defective equipment, material, or installation.

3.4 SYSTEM PERFORMANCE TESTS

Before each refrigeration system is accepted, tests to demonstrate the general operating characteristics of all equipment shall be conducted by a registered professional engineer or an approved manufacturer's start-up representative experienced in system start-up and testing, at such times as directed. Tests shall cover a period of not less than 48 hours for each system and shall demonstrate that the entire system is functioning in accordance with the drawings and specifications. Corrections and adjustments shall be made as necessary and tests shall be re-conducted to demonstrate that the entire system is functioning as specified. Prior to acceptance, service valve seal caps and blanks over gauge points shall be installed and tightened. Any refrigerant lost during the system startup shall be replaced. If tests do not demonstrate satisfactory system performance, deficiencies shall be corrected and the system shall be retested. Tests shall be conducted in the presence of the Contracting Officer. Water and electricity required for the tests will be furnished by the Government. Any material, equipment, instruments, and personnel required for the test shall be provided by the Contractor. Field tests shall be coordinated with Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

3.5 Testing, Adjusting, and Balancing

Testing, adjusting, and balancing shall be as specified in Section 15990 TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS.

3.6 DEMONSTRATIONS

Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total 2 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests. The field posted instructions shall cover all of the items contained in the approved operation and maintenance manuals as well as demonstrations of routine maintenance operations.

-- End of Section --

SECTION 15895A

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 210 (1999) Laboratory Methods of Testing Fans for Rating

AMCA 300 (1996) Reverberant Room Method for Sound Testing of Fans

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA Std 9 (1990) Load Ratings and Fatigue Life for Ball Bearings

ABMA Std 11 (1990; R 1999) Load Ratings and Fatigue Life for Roller Bearings

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M (2001) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM C 1071 (1998) Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)

ASTM C 916 (1985; R 1996el) Adhesives for Duct Thermal Insulation

ASTM E 84 (2000a) Surface Burning Characteristics of Building Materials

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 52.1 (1992) Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter

ASHRAE 70 (1991) Method of Testing for Rating the Performance of Air Outlets and Inlets

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (1999) Installation of Air Conditioning and

Ventilating Systems

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA HVAC Duct Const Stds (1995; Addenda Nov 1997) HVAC Duct
Construction Standards - Metal and Flexible

SMACNA Leakage Test Mnl (1985) HVAC Air Duct Leakage Test Manual

UNDERWRITERS LABORATORIES (UL)

UL 181 (1996; Rev Dec 1998) Factory-Made Air Ducts
and Air Connectors

UL 214 (1997) Tests for Flame-Propagation of
Fabrics and Films

UL 586 (1996; Rev thru Aug 1999) High-Efficiency,
Particulate, Air Filter Units

UL 723 (1996; Rev thru Dec 1998) Test for Surface
Burning Characteristics of Building
Materials

UL 900 (1994; Rev thru Nov 1999) Test Performance
of Air Filter Units

UL Bld Mat Dir (1999) Building Materials Directory

1.2 COORDINATION OF TRADES

Ductwork, piping offsets, fittings, and accessories shall be furnished as required to provide a complete installation and to eliminate interference with other construction.

1.3 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings; G

Drawings shall consist of equipment layout including assembly and installation details and electrical connection diagrams; ductwork layout showing the location of all supports and hangers, typical hanger details, gauge reinforcement, reinforcement spacing rigidity

classification, and static pressure and seal classifications; and piping layout showing the location of all guides and anchors, the load imposed on each support or anchor, and typical support details. Drawings shall include any information required to demonstrate that the system has been coordinated and will properly function as a unit and shall show equipment relationship to other parts of the work, including clearances required for operation and maintenance.

SD-03 Product Data

Components and Equipment

Manufacturer's catalog data shall be included with the detail drawings for the following items. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with contract requirements for the following:

- b. Ductwork Components
- c. Air Systems Equipment

Test Procedures;

Proposed test procedures for ductwork leak test at least 2 weeks prior to the start of related testing.

Similar Services;

Statement demonstrating successful completion of similar services on at least 5 projects of similar size and scope, at least 2 weeks prior to submittal of other items required by this section.

Testing, Adjusting and Balancing;

Proposed test schedules for hydrostatic test of piping, ductwork leak test, and performance tests, at least 2 weeks prior to the start of related testing.

Field Training;

Proposed schedule for field training, at least 2 weeks prior to the start of related training.

SD-06 Test Reports

Performance Tests

Test reports for the ductwork leak test, and performance tests in booklet form, upon completion of testing. Reports shall document phases of tests performed including initial test summary, repairs/adjustments made, and final test results.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Components and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of products that are of a similar

material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years before bid opening. The 2-year experience shall include applications of components and equipment under similar circumstances and of similar size. The 2 years must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. The equipment items shall be supported by a service organization.

2.2 ASBESTOS PROHIBITION

Asbestos and asbestos-containing products shall not be used.

2.3 NAMEPLATES

Equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.4 EQUIPMENT GUARDS AND ACCESS

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or guarded according to OSHA requirements. High temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard shall be properly guarded or covered with insulation of a type specified.

2.5 DUCTWORK COMPONENTS

2.5.1 Metal Ductwork

All aspects of metal ductwork construction, including all fittings and components, shall comply with SMACNA HVAC Duct Const Stds unless otherwise specified. Elbows shall be radius type with a centerline radius of 1-1/2 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes may be used. Static pressure Class 1 inch w.g. ductwork shall meet the requirements of Seal Class C, unless otherwise noted. Sealants shall conform to fire hazard classification specified in Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS. Pressure sensitive tape shall not be used as a sealant.

The sealant shall be applied to the exposed male part of the fitting collar so that the sealer will be on the inside of the joint and fully protected by the metal of the duct fitting. One brush coat of the sealant shall be applied over the outside of the joint to at least 2 inch band width covering all screw heads and joint gap. Dents in the male portion of the slip fitting collar will not be acceptable.

2.5.1.1 Transitions

Diverging air flow transitions shall be made with each side pitched out a maximum of 15 degrees, for an included angle of 30 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated. Factory-fabricated reducing fittings for systems using round duct sections when formed to the shape of the ASME short flow nozzle, need

not comply with the maximum angles specified.

2.5.1.2 Insulated Nonmetallic Flexible Duct Runouts

Flexible duct runouts shall be used only where indicated. Runout length shall be as shown on the drawings, but shall in no case exceed 10 feet. Runouts shall be preinsulated, factory fabricated, and shall comply with NFPA 90A and UL 181. Either field or factory applied vapor barrier shall be provided. Where coil induction or high velocity units are supplied with vertical air inlets, a streamlined and vaned and mitered elbow transition piece shall be provided for connection to the flexible duct or hose. The last elbow to these units, other than the vertical air inlet type, shall be a die-stamped elbow and not a flexible connector. Insulated flexible connectors may be used as runouts. The insulated material and vapor barrier shall conform to the requirements of Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS. The insulation material surface shall not be exposed to the air stream.

2.5.1.3 General Service Duct Connectors

A flexible duct connector approximately 6 inches in width shall be provided where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, the flexible material shall be secured by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct construction methods. The composite connector system shall comply with UL 214 and be classified as "flame-retarded fabrics" in UL Bld Mat Dir.

2.5.2 Ductwork Accessories

2.5.2.1 Splitters and Manual Balancing Dampers

Splitters and manual balancing dampers shall be furnished with accessible operating mechanisms. Where operators occur in finished portions of the building, operators shall be chromium plated with all exposed edges rounded. Splitters shall be operated by quadrant operators or 3/16 inch rod brought through the side of the duct with locking setscrew and bushing. Two rods are required on splitters over 8 inches. Manual volume control dampers shall be operated by locking-type quadrant operators. Dampers and splitters shall be 2 gauges heavier than the duct in which installed. Unless otherwise indicated, multileaf dampers shall be opposed blade type with maximum blade width of 12 inches. Access doors or panels shall be provided for all concealed damper operators and locking setscrews. Unless otherwise indicated, the locking-type quadrant operators for dampers, when installed on ducts to be thermally insulated, shall be provided with stand-off mounting brackets, bases, or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer. Volume dampers shall be provided where indicated.

2.5.3 Duct Sleeves, Framed Prepared Openings, Closure Collars

2.5.3.1 Duct Sleeves

Duct sleeves shall be provided for round ducts 15 inches in diameter or less passing through floors, walls, ceilings, or roof, and installed during construction of the floor, wall, ceiling, or roof. Round ducts larger than

15 inches in diameter and square, rectangular, and oval ducts passing through floors, walls, ceilings, or roof shall be installed through framed prepared openings. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Framed prepared openings shall be fabricated from 20 gauge galvanized steel, unless otherwise indicated. Where sleeves are installed in bearing walls or partitions, black steel pipe, ASTM A 53/A 53M, Schedule 20 shall be used. Sleeve shall provide 1 inch clearance between the duct and the sleeve or 1 inch clearance between the insulation and the sleeve for insulated ducts.

2.5.3.2 Framed Prepared Openings

Openings shall have 1 inch clearance between the duct and the opening or 1 inch clearance between the insulation and the opening for insulated ducts.

2.5.3.3 Closure Collars

Collars shall be fabricated of galvanized sheet metal not less than 4 inches wide, unless otherwise indicated, and shall be installed on exposed ducts on each side of walls or floors where sleeves or prepared openings are provided. Collars shall be installed tight against surfaces. Collars shall fit snugly around the duct or insulation. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars for round ducts 15 inches in diameter or less shall be fabricated from 20 gauge galvanized steel. Collars for round ducts larger than 15 inches and square, and rectangular ducts shall be fabricated from 18 gauge galvanized steel. Collars shall be installed with fasteners on maximum 6 inch centers, except that not less than 4 fasteners shall be used.

2.5.4 Sound Attenuation Equipment

a. Acoustical Duct Liner:

Acoustical duct lining shall be fibrous glass designed exclusively for lining ductwork and shall conform to the requirements of ASTM C 1071, Type I and II. Liner composition may be uniform density, graduated density, or dual density, as standard with the manufacturer. Lining shall be coated, not less than 1 inch thick. Where acoustical duct liner is used, liner or combination of liner and insulation applied to the exterior of the ductwork shall be the thermal equivalent of the insulation specified in Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS. Duct sizes shown shall be increased to compensate for the thickness of the lining used.

2.5.5 Diffusers, Registers, and Grilles

Units shall be factory-fabricated of steel, brass, brass-plated, or aluminum, unless otherwise noted and shall distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 50 fpm in occupied zone, or dead spots anywhere in the conditioned area. Outlets for diffusion, spread, throw, and noise level shall be as required for specified performance. Performance shall be certified according to ASHRAE 70. Inlets and outlets shall be sound rated and certified according to ASHRAE 70. Sound power level shall be as indicated. Diffusers and registers shall be provided with volume damper with accessible operator, unless otherwise indicated; or if standard with

the manufacturer, an automatically controlled device will be acceptable. Volume dampers shall be opposed blade type for all diffusers and registers.

2.5.5.1 Diffusers

Diffuser types shall be as indicated. Ceiling mounted units shall be furnished with anti-smudge devices, unless the diffuser unit minimizes ceiling smudging through design features. Diffusers shall be provided with air deflectors of the type indicated. Ceiling mounted units shall be installed with rims tight against ceiling. Sponge rubber gaskets shall be provided between ceiling and surface mounted diffusers for air leakage control. Suitable trim shall be provided for flush mounted diffusers. Duct collar connecting the duct to diffuser shall be airtight and shall not interfere with volume controller. Return or exhaust units shall be similar to supply diffusers.

2.5.5.2 Registers and Grilles

Units shall be four-way directional-control type, except that return and exhaust registers may be fixed horizontal or vertical louver type similar in appearance to the supply register face. Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Wall supply registers shall be installed at least 6 inches below the ceiling unless otherwise indicated. Return and exhaust registers shall be located 6 inches above the floor unless otherwise indicated. Four-way directional control may be achieved by a grille face which can be rotated in 4 positions or by adjustment of horizontal and vertical vanes. Grilles shall be as specified for registers, without volume control damper.

2.6 AIR SYSTEMS EQUIPMENT

2.6.1 Fans

Fans shall be tested and rated according to AMCA 210. Fans are to be directly connected to the motors. Each fan shall be selected to produce the capacity required at the fan static pressure indicated. Fan performance curve for each fan shall be submitted. Sound power level shall be as indicated. Sound power data for each fan shall be submitted. The sound power level values shall be obtained according to AMCA 300. Standard AMCA arrangement, rotation, and discharge shall be as indicated.

2.6.1.1 In-Line Centrifugal Fans

In-line fans shall have centrifugal backward inclined blades, stationary discharge conversion vanes, internal and external belt guards, and adjustable motor mounts. Fans shall be mounted in a welded tubular casing. Air shall enter and leave the fan axially. Inlets shall be streamlined with conversion vanes to eliminate turbulence and provide smooth discharge air flow. Fan bearings and drive shafts shall be enclosed and isolated from the air stream. Fan bearings shall be sealed against dust and dirt and shall be permanently lubricated, and shall be precision self aligning ball or roller type. Bearing life shall be L50 rated at not less than 200,000 hours as defined by ABMA Std 9 and ABMA Std 11. Motors shall be permanently lubricated and carefully matched to the fan loads.

2.6.1.2 Attic Fans

Fans shall be low profile direct drive. Propellers shall have aluminum or galvanized blades and be statically and dynamically balanced. Motors shall

be permanent split capacitor type with permanently lubricated bearings with built-in thermal overload protection. Fan shall be Home Ventilating Institute certified for air performance and shall be UL listed. Fan shall be of bolted and welded construction on a coated steel fan panel with welded corners, mounting holes and integral venturi. Fan shall be provided with birdscreen and thermostat.

2.6.1.3 Ceiling Exhaust Fans

Suspended cabinet-type ceiling exhaust fans shall be centrifugal type, direct-driven. Fans shall have acoustically insulated housing. Integral backdraft damper shall be chatter-proof. The integral face grille shall be of egg-crate design or louver design. Fan motors shall be mounted on vibration isolators. Unit shall be provided with mounting flange for hanging unit from above. Fans shall be U.L. listed.

2.6.1.4 Range Hood Wall Jack

Hooded rectangle shape with duct connection sized as indicated, spring-loaded backdraft damper, birdscreen, aluminum construction natural finish.

2.6.1.5 Exhaust Fan Wall Jack/Dryer Wall Jack

Hooded square shape with duct connection, size as indicated, spring loaded backdraft damper, birdscreen, aluminum construction natural finish.

2.6.2 Air Filters

Air filters shall be listed according to requirements of UL 900, except high efficiency particulate air filters of 99.97 percent efficiency by the DOP Test method shall be as listed under the Label Service and shall meet the requirements of UL 586.

2.6.2.1 Replaceable Media Filters

Replaceable media filters shall be the dry-media type, of the size required to suit the application. Filtering media shall be not less than 1 inch thick fibrous glass media pad supported by a structural wire grid or woven wire mesh. Pad shall be enclosed in a holding frame of not less than 16 gauge galvanized steel, and equipped with quick-opening mechanism for changing filter media. Average efficiency shall be not less than 20 percent when tested according to ASHRAE 52.1.

2.6.2.2 Electronic Air Cleaner

Electronic air cleaner shall be duct mounted suitable for mounting in the vertical or horizontal position of the return air duct system. Unit shall be fully assembled, constructed of a heavy-gage steel cabinet, UL listed and capable of converting 120 VAC power supply to DC current that utilizes a charged collecting plate to remove airborne particles. Air cleaner shall be provided with a flow switch to allow operation only when the furnace is operating.

PART 3 EXECUTION

3.1 INSTALLATION

Work shall be installed as shown and according to the manufacturer's

diagrams and recommendations.

3.1.1 Flexible Connectors

Pre-insulated flexible connectors and flexible duct shall be attached to other components in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the connector or duct manufacturer and shall be provided at the intervals recommended.

3.1.2 Sleeved and Framed Openings

Space between the sleeved or framed opening and the duct or the duct insulation shall be packed as specified in Section 07840A FIRESTOPPING for fire rated penetrations. For non-fire rated penetrations, the space shall be packed as specified in Section 07900A JOINT SEALING.

3.1.3 Metal Ductwork

Installation shall be according to SMACNA HVAC Duct Const Stds unless otherwise indicated. Duct supports for sheet metal ductwork shall be according to SMACNA HVAC Duct Const Stds, unless otherwise specified. Friction beam clamps indicated in SMACNA HVAC Duct Const Stds shall not be used. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free vertical movement of the duct. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided.

3.1.4 Acoustical Duct Lining

Lining shall be applied in cut-to-size pieces attached to the interior of the duct with nonflammable fire resistant adhesive conforming to ASTM C 916, Type I, NFPA 90A, UL 723, and ASTM E 84. Top and bottom pieces shall lap the side pieces and shall be secured with welded pins, adhered clips of metal, nylon, or high impact plastic, and speed washers or welding cup-head pins installed according to SMACNA HVAC Duct Const Stds. Welded pins, cup-head pins, or adhered clips shall not distort the duct, burn through, nor mar the finish or the surface of the duct. Pins and washers shall be flush with the surfaces of the duct liner and all breaks and punctures of the duct liner coating shall be sealed with the nonflammable, fire resistant adhesive. Exposed edges of the liner at the duct ends and at other joints where the lining will be subject to erosion shall be coated with a heavy brush coat of the nonflammable, fire resistant adhesive, to prevent delamination of glass fibers. Duct liner may be applied to flat sheet metal prior to forming duct through the sheet metal brake. Lining at the top and bottom surfaces of the duct shall be additionally secured by welded pins or adhered clips as specified for cut-to-size pieces. Other methods indicated in SMACNA HVAC Duct Const Stds to obtain proper installation of duct liners in sheet metal ducts, including adhesives and fasteners, will be acceptable.

3.1.5 Insulation

Thickness and application of insulation materials for ductwork, piping, and equipment shall be according to Section 15080A THERMAL INSULATION FOR

MECHANICAL SYSTEMS.

3.1.6 Duct Test Holes

Holes with closures or threaded holes with plugs shall be provided in ducts and plenums as indicated or where necessary for the use of pitot tube in balancing the air system. Extensions, complete with cap or plug, shall be provided where the ducts are insulated.

3.2 DUCTWORK LEAK TEST

Ductwork leak test shall be performed for the entire air distribution and exhaust system, including furnaces fans, coils, filters, etc. Test procedure, apparatus, and report shall conform to SMACNA Leakage Test Mnl. The maximum allowable leakage rate is 2 percent of total system cfm.. Ductwork leak test shall be completed with satisfactory results prior to applying insulation to ductwork exterior.

3.3 CLEANING AND ADJUSTING

Ducts, plenums, and casing shall be thoroughly cleaned of debris and blown free of small particles of rubbish and dust and then shall be vacuum cleaned before installing outlet faces. Equipment shall be wiped clean, with traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided prior to startup of all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building, and the ducts, plenums, casings, and other items specified have been vacuum cleaned. System shall be maintained in this clean condition until final acceptance. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

3.4 TESTING, ADJUSTING, AND BALANCING

Testing, adjusting, and balancing shall be as specified in Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS. Testing, adjusting, and balancing shall begin only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

-- End of Section --

SECTION 15990A

TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	(1989) National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems
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NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB Procedural Stds	(1991) Procedural Standards for Testing Adjusting Balancing of Environmental Systems
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

TAB Schematic Drawings and Report Forms; G

Three copies of the TAB Schematic Drawings and Report Forms, no later than 21 days prior to the start of TAB field measurements.

SD-03 Product Data

TAB Procedures; G

Proposed procedures for TAB, submitted with the TAB Schematic Drawings and Report Forms.

Calibration; G

List of each instrument to be used during TAB, stating calibration requirements required or recommended by both the TAB Standard and the instrument manufacturer and the actual calibration history of the instrument, submitted with the TAB Procedures. The calibration history shall include dates calibrated, the qualifications of the calibration laboratory, and the calibration procedures used.

Systems Readiness Check

Proposed date and time to begin the Systems Readiness Check, no later than 7 days prior to the start of the Systems Readiness Check.

TAB Execution; G

Proposed date and time to begin field measurements, making adjustments, etc., for the TAB Report, submitted with the Systems Readiness Check Report.

TAB Verification; G

Proposed date and time to begin the TAB Verification, submitted with the TAB Report.

SD-06 Test Reports

Design Review Report; G

A copy of the Design Review Report, no later than 14 days after approval of the TAB Firm and the TAB Specialist.

Systems Readiness Check; G

A copy of completed checklists for each system, each signed by the TAB Specialist, at least 7 days prior to the start of TAB Execution. All items in the Systems Readiness Check Report shall be signed by the TAB Specialist and shall bear the seal of the Professional Society or National Association used as the TAB Standard.

TAB Report; G

Three copies of the completed TAB Reports, no later than 7 days after the execution of TAB. All items in the TAB Report shall be signed by the TAB Specialist and shall bear the seal of the Professional Society or National Association used as the TAB Standard.

TAB Verification Report; G

Three copies of the completed TAB Verification Report, no later than 7 days after the execution of TAB Verification. All items in the TAB Verification Report shall be signed by the TAB Specialist and shall bear the seal of the Professional Society or National Association used as the TAB Standard.

SD-07 Certificates

Ductwork Leak Testing, G, RE

A written statement signed by the TAB Specialist certifying that the TAB Specialist witnessed the Ductwork Leak Testing, it was successfully completed, and that there are no known deficiencies related to the ductwork installation that will prevent TAB from producing satisfactory results.

TAB Firm;

Certification of the proposed TAB Firm's qualifications by either AABC or NEBB to perform the duties specified herein and in other related Sections, no later than 21 days after the Notice to Proceed. The documentation shall include the date that the Certification was initially granted and the date that the current Certification expires. Any lapses in Certification of the proposed TAB Firm or disciplinary action taken by AABC or NEBB against the proposed TAB Firm shall be described in detail.

TAB Specialist;

Certification of the proposed TAB Specialist's qualifications by either AABC or NEBB to perform the duties specified herein and in other related Sections, no later than 21 days after the Notice to Proceed. The documentation shall include the date that the Certification was initially granted and the date that the current Certification expires. Any lapses in Certification of the proposed TAB Specialist or disciplinary action taken by AABC or NEBB against the proposed TAB Specialist shall be described in detail.

1.3 SIMILAR TERMS

In some instances, terminology differs between the Contract and the TAB Standard primarily because the intent of this Section is to use the industry standards specified, along with additional requirements listed herein to produce optimal results. The following table of similar terms is provided for clarification only. Contract requirements take precedent over the corresponding AABC or NEBB requirements where differences exist.

SIMILAR TERMS

Contract Term	AABC Term	NEBB Term
TAB Standard Systems.	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing Adjusting Balancing of Environmental
TAB Specialist	TAB Engineer	TAB Supervisor
Systems Readiness Check	Construction Phase Inspection	Field Readiness Check & Preliminary Field Procedures.

1.4 TAB STANDARD

TAB shall be performed in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-lor NEBB Procedural Stds, unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. The provisions of the TAB Standard, including checklists, report forms, etc., shall, as nearly as practical, be used to satisfy the Contract requirements. The TAB Standard shall be used for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB

Standard, the manufacturer's recommendations shall be adhered to. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, TAB procedures shall be developed by the TAB Specialist. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC or NEBB), the requirements and recommendations contained in these procedures and requirements shall be considered mandatory.

1.5 QUALIFICATIONS

1.5.1 TAB Firm

The TAB Firm shall be either a member of AABC or certified by the NEBB and certified in all categories and functions where measurements or performance are specified on the plans and specifications, including TAB of environmental systems and the measuring of sound and vibration in environmental systems. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the firm loses subject certification during this period, the Contractor shall immediately notify the Contracting Officer and submit another TAB Firm for approval. Any firm that has been the subject of disciplinary action by either the AABC or the NEBB within the five years preceding Contract Award shall not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections to be performed by the TAB Firm shall be considered invalid if the TAB Firm loses its certification prior to Contract completion and must be performed by an approved successor. These TAB services are to assist the prime Contractor in performing the quality oversight for which it is responsible. The TAB Firm shall be a subcontractor of the prime Contractor, and shall report to and be paid by the prime Contractor.

1.5.2 TAB Specialist

The TAB Specialist shall be either a member of AABC or an experienced technician of the Firm certified by the NEBB. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject certification during this period, the Contractor shall immediately notify the Contracting Officer and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by either the AABC or the NEBB within the five years preceding Contract Award shall not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections performed by the TAB Specialist shall be considered invalid if the TAB Specialist loses its certification prior to Contract completion and must be performed by the approved successor.

1.6 TAB SPECIALIST RESPONSIBILITIES

All TAB work specified herein and in related sections shall be performed under the direct guidance of the TAB Specialist.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 DESIGN REVIEW

The TAB Specialist shall review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the HVAC systems from effectively operating in accordance with the sequence of operation specified or prevent the effective and accurate TAB of the system. The TAB Specialist shall provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

3.2 TAB RELATED HVAC SUBMITTALS

The TAB Specialist shall prepare a list of the submittals from the Contract Submittal Register that relate to the successful accomplishment of all HVAC TAB. The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the TAB Specialist when submitted to the Government. The TAB Specialist shall also ensure that the location and details of ports, terminals, connections, etc., necessary to perform TAB are identified on the submittals.

3.3 TAB SCHEMATIC DRAWINGS AND REPORT FORMS

A schematic drawing showing each system component, including balancing devices, shall be provided for each system. Each drawing shall be accompanied by a copy of all report forms required by the TAB Standard used for that system. Where applicable, the acceptable range of operation or appropriate setting for each component shall be included on the forms or as an attachment to the forms. The schematic drawings shall identify all testing points and cross reference these points to the report forms and procedures.

3.4 DUCTWORK LEAK TESTING

The TAB Specialist shall witness the Ductwork Leak Testing specified in Section 15895A AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM and approve the results as specified in Paragraph TAB RELATED HVAC SUBMITTALS.

3.5 TESTING, ADJUSTING, AND BALANCING

3.5.1 TAB Procedures

Step by step procedures for each measurement required during TAB Execution shall be provided. The procedures shall be oriented such that there is a separate section for each system. The procedures shall include measures to ensure that each system performs as specified in all operating modes, interactions with other components (such as exhaust fans, kitchen hoods, fume hoods, relief vents, etc.) and systems, and with all seasonal operating differences, diversity, simulated loads, and pressure relationships required.

3.5.2 Systems Readiness Check

The TAB Specialist shall inspect each system to ensure that it is complete, including installation and operation of controls, and that all aspects of the facility that have any bearing on the HVAC systems, including installation of ceilings, walls, windows, doors, and partitions, are complete to the extent that TAB results will not be affected by any detail or touch-up work remaining. The TAB Specialist shall also verify that all items such as ductwork and piping ports, terminals, connections, etc.,

necessary to perform TAB shall be complete during the Systems Readiness Check.

3.5.3 Preparation of TAB Report

Preparation of the TAB Report shall begin only when the Systems Readiness Report has been approved. The Report shall be oriented so that there is a separate section for each system. The Report shall include a copy of the appropriate approved Schematic Drawings and TAB Related Submittals, such as pump curves, fan curves, etc., along with the completed report forms for each system. The operating points measured during successful TAB Execution and the theoretical operating points listed in the approved submittals shall be marked on the performance curves and tables. Where possible, adjustments shall be made using an "industry standard" technique which would result in the greatest energy savings, such as adjusting the speed of a fan instead of throttling the flow. Any deficiencies outside of the realm of normal adjustments and balancing during TAB Execution shall be noted along with a description of corrective action performed to bring the measurement into the specified range. If, for any reason, the TAB Specialist determines during TAB Execution that any Contract requirement cannot be met, the TAB Specialist shall immediately provide a written description of the deficiency and the corresponding proposed corrective action necessary for proper system operation to the Contracting Officer.

3.5.4 TAB Verification

The TAB Specialist shall recheck ten percent of the measurements listed in the Tab Report and prepare a TAB Verification Report. The measurements selected for verification and the individuals that witness the verification will be selected by the Contracting Officer's Representative (COR). The measurements will be recorded in the same manner as required for the TAB Report. All measurements that fall outside the acceptable operating range specified shall be accompanied by an explanation as to why the measurement does not correlate with that listed in the TAB Report and a description of corrective action performed to bring the measurement into the specified range. The TAB Specialist shall update the original TAB report to reflect any changes or differences noted in the TAB verification report and submit the updated TAB report. If over 20 percent of the measurements selected by the COR for verification fall outside of the acceptable operating range specified, the COR will select an additional ten percent for verification. If over 20 percent of the total tested (including both test groups) fall outside of the acceptable range, the TAB Report shall be considered invalid and all contract TAB work shall be repeated beginning with the Systems Readiness Check.

3.5.5 Marking of Setting

Following approval of TAB Verification Report, the setting of all HVAC adjustment devices including valves, splitters, and dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time.

3.5.6 Identification of Test Ports

The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leakage or to maintain integrity of vapor barrier.

-- End of Section --

SECTION 16273N

SINGLE-PHASE PAD-MOUNTED TRANSFORMERS
01/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C57.12.25	(1990) Transformers - Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage, 34 500 GrdY/19 920 Volts and Below; Low-Voltage, 240/120 Volts; 167 kVA and Smaller
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM D 117	(1996) Electrical Insulating Oils of Petroleum Origin
ASTM D 1535	(1997) Specifying Color by the Munsell System
ASTM D 3487	(1988; R 1993) Mineral Insulating Oil Used in Electrical Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 386	(1995) Separable Insulated Connector Systems for Power Distribution Systems Above 600 V (IEEE)
IEEE C2	(1997) National Electrical Safety Code (IEEE)
IEEE C57.12.00	(2000) Liquid-Immersed Distribution, Power, and Regulating Transformers (IEEE)
IEEE C57.12.80	(1978; R 1992) Terminology for Power and Distribution Transformers (IEEE)
IEEE C57.12.90	(1999) Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers (IEEE)
IEEE C57.98	(1993; Correction 1998) Guide for Transformer Impulse Tests (IEEE)

IEEE C62.11 (1999) Metal-Oxide Surge Arresters for AC Power Circuits (> 1 kV) (IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C37.47 (1981; R 1992) Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses

NEMA C57.12.28 (1999) Pad-Mounted Equipment - Enclosure Integrity (Revision of ANSI C57.12.28-88)

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (1999) Electrical Power Distribution Equipment and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 467 (1993; R 1999, Bul. 2000) Grounding and Bonding Equipment

1.2 RELATED REQUIREMENTS

Section 16375A, "Electrical Distribution System, Underground" applies to this section, with the additions and modifications specified herein.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures." As an exception to this paragraph, transformers manufactured by ABB in Jefferson City, MO; by Cooper Power Systems in Waukesha, WI; or by Howard Industries in Laurel, MS need not meet the submittal requirements of this contract. Instead, the following shall be submitted:

- a. A certification, from the manufacturer, that the technical requirements of this specification shall be met.
- b. An outline drawing of the transformer with devices identified (paragraph entitled "Pad-Mounted Transformer Drawings," item a).
- c. ANSI nameplate data of the transformer (paragraph entitled "Pad-Mounted Transformer Drawings," item b).
- d. Routine and other tests (paragraph entitled "Routine and Other Tests"), shall be conducted by the manufacturer and may be witnessed by the Government (paragraph entitled "Source Quality Control"). Provide transformer test schedule required by submittal item "SD-11 Closeout Submittals". Provide certified copies of the tests.
- e. Provide acceptance test reports required by submittal item "SD-06 Test Reports".

- f. Provide operation and maintenance manuals required by submittal item "SD-10 Operation and Maintenance Data".

SD-02 Shop Drawings

Pad-mounted transformer drawings; G

SD-03 Product Data

Single-phase pad-mounted transformers (dead-front); G

Submittal shall include manufacturer's information for each component, device, and accessory provided with the transformer.

SD-06 Test Reports

Acceptance checks and tests; G

Submit report of results of acceptance checks and tests specified by paragraph entitled "Field Quality Control."

SD-07 Certificates

Transformer losses; G

SD-09 Manufacturer's Field Reports

Pad-mounted transformer design tests; G

Pad-mounted transformer routine and other tests; G

SD-10 Operation and Maintenance Data

Transformer(s), Data Package 5; G

Submit operation and maintenance data in accordance with Section 01781, "Operation and Maintenance Data" and as specified herein.

SD-11 Closeout Submittals

Transformer test schedule; G

1.4 QUALITY ASSURANCE

1.4.1 Pad-Mounted Transformer Drawings

Drawings shall indicate, but not be limited to the following:

- a. An outline drawing, including front, top, and side views.
- b. ANSI nameplate data.
- c. One-line diagram, including switch(es) and fuses.
- d. Manufacturer's published time-current curves (on full size logarithmic paper) of the transformer high side fuse.

1.4.2 Transformer Losses

Submit certification from the manufacturer indicating conformance with the paragraph entitled "Specified Transformer Losses."

1.5 MAINTENANCE

1.5.1 Additions to Operation and Maintenance Data

In addition to requirements of Data Package 5, include the following on the actual transformer(s) provided:

- a. An instruction manual with pertinent items and information highlighted
- b. An outline drawing, including front, top, and side views
- c. Prices for spare parts and supply list
- d. Routine and field acceptance test reports
- e. Fuse curves for primary fuses
- f. Actual nameplate diagram
- g. Date of purchase

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

Products and materials not considered to be pad-mounted transformers and related accessories are specified in 16415, "Electrical Work, Interior.

2.2 SINGLE-PHASE PAD-MOUNTED TRANSFORMERS (DEAD-FRONT)

ANSI C57.12.25, NEMA C57.12.28, and as specified herein.

2.2.1 Compartment Construction

- a. Single compartment: Shall be Type 1 as defined by ANSI C57.12.25 with combination high- and low-voltage compartment. Compartment shall be of the clam shell type with lockable (having pad-locking provisions) hinged cover and single-point latching.
- b. Two compartment: The high- and low-voltage compartments shall be separated by steel isolating barriers extending the full height and depth of the compartments. Compartment doors: hinged lift-off type with stop in open position and three-point latching.

2.2.1.1 High Voltage

High-voltage portion shall contain the incoming line, insulated high-voltage load-break connectors, bushing well inserts, two high-voltage bushing wells configured for loop feed application, access to oil-immersed fuses, dead-front surge arresters, tap changer handle, connector parking stands with insulated standoff bushings, protective caps, and ground pad.

- a. Insulated high-voltage load-break connectors: IEEE Std 386, rated 15kV, 95kV BIL. Current rating: 200 amperes rms continuous.

Short time rating: 10,000 amperes rms symmetrical for a time duration of 0.17 seconds. Connectors and inserts shall be the product of a single manufacturer. Connector shall have a steel reinforced hook-stick eye, grounding eye, test point, and arc-quenching contact material.

- b. Bushing well inserts: IEEE Std 386, 200 amperes, 15 kV class. Provide a bushing well insert for each bushing well unless indicated otherwise.
- c. Provide bayonet oil-immersed, expulsion fuses in series with oil-immersed, partial-range, current-limiting fuses. Bayonet fuse links shall sense both high currents and high oil temperature in order to provide thermal protection to the transformer. Coordinate transformer protection with expulsion fuse clearing low-current faults and current-limiting fuse clearing high-current faults beyond the interrupting rating of the expulsion fuse. In order to eliminate or minimize oil spills, the bayonet fuse assembly shall include an oil retention valve inside the housing which closes when the fuse holder is removed and an external drip shield. Warning shall be conspicuously displayed adjacent to the bayonet fuse(s) cautioning against removing or inserting fuses unless the transformer has been de-energized and the tank pressure has been released.

Bayonet fuse assembly: 95 kV BIL.

Oil-immersed current-limiting fuses: NEMA C37.47; 50,000 rms amperes symmetrical interrupting rating at the system voltage specified.

- d. Surge arresters: IEEE C62.11, rated 3 kV, fully shielded, dead-front metal-oxide-varister, elbow type with resistance-graded gap suitable for plugging into inserts as indicated.
- e. Parking stands: Provide a parking stand near each bushing well. Provide insulated standoff bushings for parking of energized load-break connectors on parking stands.
- f. Protective caps: IEEE Std 386, 200 amperes, 15kV class. Provide insulated protective caps (not shipping caps) for insulating and sealing out moisture from unused bushing well inserts and insulated standoff bushings.

2.2.1.2 Low Voltage

Low-voltage portion shall contain low-voltage bushings with NEMA spade terminals sized to accommodate the number and size of cables shown, accessories, stainless steel or laser-etched anodized aluminum diagrammatic transformer nameplate, and ground pad.

- a. Accessories shall include drain plug, fill plug, pressure relief device and a liquid level sight gage.

2.2.2 Transformer Type and Ratings

- a. Oil-insulated, two winding, 60 hertz, 65 degrees C rise above a 30 degrees C average ambient, self-cooled type.

- b. Transformer voltage ratings(Single Phase): 4160/2400 V - 240/120 V.
- c. Tap changer shall be externally operated, manual type for changing tap setting when the transformer is de-energized. Provide four 2.5 percent full capacity taps, two above and two below rated primary voltage.
- e. Transformer shall include lifting lugs and provisions for jacking under base. The transformer base construction shall be suitable for using rollers or skidding in any direction. Transformer shall have its kVA rating conspicuously displayed on its enclosure. The transformer shall have an insulated low-voltage neutral bushing with NEMA spade terminal, and with removable ground strap.

2.3 INSULATING LIQUID

- a. Mineral oil: ASTM D 3487, Type II, tested in accordance with ASTM D 117. Provide identification of transformer as non-PCB and Type II mineral oil on the nameplate.

2.4 CORROSION PROTECTION

Base and cabinets of two compartment transformers shall be corrosion resistant and shall be stainless steel, conforming to ASTM A 167, Type 304 or 304L. Base shall include any part of pad-mounted transformer that is within 3 inches of concrete pad. Paint bases, cabinets, and tanks Munsell 7GY3.29/1.5 green. Paint coating system shall comply with NEMA C57.12.28 regardless of base, cabinet, and tank material. The Munsell color notation is specified in ASTM D 1535.

2.5 WARNING SIGNS

Provide as specified in Section 16375, "Electrical Distribution System, Underground"

2.6 SOURCE QUALITY CONTROL

2.6.1 Transformer Test Schedule

The Government reserves the right to witness tests. Provide transformer test schedule for tests to be performed at the manufacturer's test facility. Submit required test schedule and location, and notify the Contracting Officer 30 calendar days before scheduled test date. Notify Contracting Officer 15 calendar days in advance of changes to scheduled date.

- a. Test Instrument Calibration

(1) The manufacturer shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.

(2) The accuracy shall be directly traceable to the National Institute of Standards and Technology.

(3) Instrument calibration frequency schedule shall not exceed 12

months for both test floor instruments and leased specialty equipment.

(4) Dated calibration labels shall be visible on all test equipment.

(5) Calibrating standard shall be of higher accuracy than that of the instrument tested.

(6) Keep up-to-date records that indicate dates and test results of instruments calibrated or tested. For instruments calibrated by the manufacturer on a routine basis, in lieu of third party calibration, include the following:

(a) Maintain up-to-date instrument calibration instructions and procedures for each test instrument.

(b) Identify the third party/laboratory calibrated instrument to verify that calibrating standard is met.

2.6.2 Design Tests

IEEE C57.12.00, and IEEE C57.12.90. Section 5.1.2 in IEEE C57.12.80 states that "design tests are made only on representative apparatus of basically the same design." Submit design test reports (complete with test data, explanations, formulas, and results), in the same submittal package as the catalog data and drawings for the specified transformer(s). Design tests shall have been performed prior to the award of this contract.

a. Tests shall be certified and signed by a registered professional engineer.

b. Temperature rise: "Basically the same design" for the temperature rise test means a pad-mounted transformer with the same coil construction (such as wire wound primary and sheet wound secondary), the same kVA, the same cooling type (OA), the same temperature rise rating, and the same insulating liquid as the transformer specified.

c. Lightning impulse: "Basically the same design" for the lightning impulse dielectric test means a pad-mounted transformer with the same BIL, the same coil construction (such as wire wound primary and sheet wound secondary), and a tap changer, if specified. Design lightning impulse tests shall include both the primary and secondary windings of that transformer.

(1) IEEE C57.12.90, paragraph 10.3 entitled "Lightning Impulse Test Procedures," and IEEE C57.98.

(2) State test voltage levels.

(3) Provide photographs of oscilloscope display waveforms or plots of digitized waveforms with test report.

d. Lifting and moving devices: "Basically the same design" requirement for the lifting and moving devices test means a test report confirming that the lifting device being used is capable of handling the weight of the specified transformer in accordance with ANSI C57.12.25.

- e. Pressure: "Basically the same design" for the pressure test means a pad-mounted transformer with a tank volume within 30 percent of the tank volume of the transformer specified.

2.6.3 Routine and Other Tests

IEEE C57.12.00. Routine and other tests shall be performed by the manufacturer on each of the actual transformer(s) prepared for this project to ensure that the design performance is maintained in production. Submit test reports, by serial number and receive approval before delivery of equipment to the project site. Required tests shall be as follows:

- a. Cold resistance measurements (provide reference temperature)
- b. Polarity
- c. Ratio
- d. No-load losses (NLL) and excitation current
- e. Load losses (LL) and impedance voltage
- f. Dielectric
 - (1) Impulse
 - (2) Applied voltage
 - (3) Induced voltage
- g. Leak

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to IEEE C2, NFPA 70, and to requirements specified herein. Provide new equipment and materials unless indicated or specified otherwise.

3.2 GROUNDING

NFPA 70 and IEEE C2, except that grounding systems shall have a resistance to solid earth ground not exceeding 5 ohms.

3.2.1 Grounding Electrodes

Provide driven ground rods as specified in Section 16375A, "Electrical Distribution System, Underground". Connect ground conductors to the upper end of ground rods by exothermic weld or compression connector. Provide compression connectors at equipment end of ground conductors.

3.2.2 Pad-Mounted Transformer Grounding

Provide separate copper grounding conductors and connect them to the ground loop as indicated. When work in addition to that indicated or specified is required to obtain the specified ground resistance, the provision of the contract covering "Changes" shall apply.

3.2.3 Connections

Make joints in grounding conductors and loops by exothermic weld or compression connector. Exothermic welds and compression connectors shall be installed as specified in Section 16375A, "Electrical Distribution System, Underground".

3.2.4 Grounding and Bonding Equipment

UL 467, except as indicated or specified otherwise.

3.3 TRANSFORMER GROUNDING

Provide a 4/0 bare copper-ground girdle around transformer. Girdle shall be buried one foot deep and placed 3 feet laterally from the transformer enclosure. Connect girdle to enclosure at two opposite places using 4/0 copper. Exothermically weld joints.

3.4 INSTALLATION OF EQUIPMENT AND ASSEMBLIES

Install and connect pad-mounted transformers furnished under this section as indicated on project drawings, the approved shop drawings, and as specified herein.

3.5 FOUNDATION FOR EQUIPMENT AND ASSEMBLIES

Mount transformer on concrete slab. Unless otherwise indicated, the slab shall be at least 8 inches thick, reinforced with a 6 by 6 inches - W2.9 by W2.9 mesh placed uniformly 4 inches from the top of the slab. Slab shall be placed on a 6 inch thick, well-compacted gravel base. Top of concrete slab shall be approximately 4 inches above the finished grade. Edges above grade shall have 3/4 inch chamfer. Slab shall be of adequate size to project at least 810 inches beyond the equipment.

Stub up conduits, with bushings, 2 inches into cable wells in the concrete pad. Coordinate dimensions of cable wells with transformer cable training areas. Concrete work shall be as specified in Section 03307A, "Concrete for Minor Structures."

3.6 FIELD QUALITY CONTROL

3.6.1 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.6.1.1 Pad-Mounted Transformers

a. Visual and mechanical inspection

(1) Compare equipment nameplate information with specifications and approved shop drawings.

(2) Inspect physical and mechanical condition. Check for damaged or cracked insulators and leaks.

(3) Inspect all bolted electrical connections for high resistance using low-resistance ohmmeter, verifying tightness of accessible

bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey.

(4) Verify correct liquid level in tanks.

(5) Perform specific inspections and mechanical tests as recommended by manufacturer.

(6) Verify correct equipment grounding.

(7) Verify the presence of transformer surge arresters.

b. Electrical tests

(1) Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable.

(2) Perform insulation-resistance tests.

(3) Perform turns-ratio tests.

(4) Perform continuity tests.

(5) Verify that the tap-changer is set at specified ratio.

(6) Verify proper secondary voltage phase-to-phase and phase-to-neutral after energization and prior to loading.

3.6.1.2 Grounding System

a. Visual and mechanical inspection

(1) Inspect ground system for compliance with contract plans and specifications.

b. Electrical tests

Perform ground-impedance measurements utilizing the fall-of-potential method. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable ground testing megger in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.

Submit the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system. Include the test method and test setup (i.e., pin location) used to determine ground resistance and soil conditions at the time the measurements were made.

3.6.2 Follow-Up Verification

Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception

to requirements stated elsewhere in the contract, the Contracting Officer shall be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --

SECTION 16375A

ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND
02/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C119.1	(1986; R 1997) Sealed Insulated Underground Connector Systems Rated 600 Volts
ANSI C37.46	(1981; R 1992) Power Fuses and Fuse Disconnecting Switches
ANSI C37.72	(1987) Manually-Operated, Dead-Front Padmounted Switchgear with Load Interrupting Switches and Separable Connectors for Alternating-Current Systems
ANSI C57.12.28	(1999) Switchgear and Transformers - Padmounted Equipment - Enclosure Integrity
ANSI C80.1	(1995) Rigid Steel Conduit - Zinc Coated

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(2001) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2001) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B 117	(1997) Operating Salt Spray (Fog) Apparatus
ASTM B 3	(1995) Soft or Annealed Copper Wire
ASTM B 496	(1999) Compact Round Concentric-Lay-Stranded Copper Conductors
ASTM B 8	(1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 4059	(1996) Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography
ASTM D 923	(1997) Sampling Electrical Insulating Liquids

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

- AEIC CS5 (1994; CS5a-1995) Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 Through 46 kV
- AEIC CS6 (1996) Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 Through 69 kV

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

- FM P7825a (1998) Approval Guide Fire Protection

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE C2 (1997) National Electrical Safety Code
- IEEE C37.20.1 (1993) Metal-Enclosed Low-Voltage Power Circuit-Breaker Switchgear
- IEEE C37.20.2 (1993; C37.20.2b) Metal-Clad and Station-Type Cubicle Switchgear
- IEEE C37.20.3 (1997) Metal-Enclosed Interrupter Switchgear
- IEEE C37.34 (1994) Test Code for High-Voltage Air Switches
- IEEE C37.41 (1994; C37.41c) Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories
- IEEE C57.12.00 (1993) Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
- IEEE C62.1 (1989; R 1994) Surge Arresters for AC Power Circuits
- IEEE C62.11 (1999) IEEE Standard Metal-Oxide Surge Arresters for AC Power Circuits
- IEEE C62.2 (1987; R 1994) Guide for the Application of Gapped Silicon-Carbide Surge Arresters for Alternating Current Systems
- IEEE Std 100 (1997) IEEE Standard Dictionary of Electrical and Electronics Terms
- IEEE Std 386 (1995) Separable Insulated Connector Systems for Power Distribution Systems Above 600V
- IEEE Std 404 (1993) Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V Through 138 000 V and Cable Joints for Use with Laminated Dielectric Cable Rated 2500 V Through 500 000 V

IEEE Std 48	(1998) Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV
IEEE Std 592	(1990; R 1996) Exposed Semiconducting Shields on Premolded High Voltage Cable Joints and Separable Insulated Connectors
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1	(1993) Molded Case Circuit Breakers and Molded Case Switches
NEMA FB 1	(1993) Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
NEMA LA 1	(1992) Surge Arresters
NEMA TC 6	(1990) PVC and ABS Plastic Utilities Duct for Underground Installation
NEMA WC 7	(1988; Rev 3 1996) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC 8	(1988; Rev 3 1996) Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL 1072	(1995; Rev Mar 1998) Medium Voltage Power Cables
UL 1242	(1996; Rev Mar 1998) Intermediate Metal Conduit
UL 467	(1993; Rev thru Apr 1999) Grounding and Bonding Equipment
UL 486A	(1997; Rev thru Dec 1998) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 489	(1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 510	(1994; Rev thru Apr 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514A	(1996; Rev Dec 1999) Metallic Outlet Boxes
UL 6	(1997) Rigid Metal Conduit
UL 651	(1995; Rev thru Oct 1998) Schedule 40 and 80 Rigid PVC Conduit
UL 854	(1996; Rev Oct 1999) Service-Entrance Cables

1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Electrical Distribution System;

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams manufacturers standard installation drawings and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be included with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components are assembled, function together and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall consist of the following:

a. Detail drawings showing physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway entrance, access requirements for installation and maintenance, physical size, electrical

characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. All optional items shall be clearly identified as included or excluded.

b. Internal wiring diagrams of equipment showing wiring as actually provided for this project. External wiring connections shall be clearly identified.

Detail drawings shall as a minimum depict the installation of the following items:

a. Medium-voltage cables and accessories including cable installation plan.

As-Built Drawings;

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract drawings as well as deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall provide three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within 10 calendar days from the time the drawings are returned to the Contractor.

Nameplates;

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material and Equipment;

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

General Installation Requirements;

As a minimum, installation procedures for transformers, substations, switchgear, and medium-voltage cable terminations and splices.

Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust,

calibrate, and test the devices and equipment.

SD-06 Test Reports

Factory Tests;

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by standards listed in paragraph REFERENCES. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in paragraph FIELD TESTING shall be included.

Field Testing;

A proposed field test plan, 30 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Operating Tests;

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The condition specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.

Cable Installation; G,

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings from which material may readily be removed and replaced, including a separate section for each cable pull. Sections shall be separated by heavy plastic dividers with tabs, with all data sheets signed and dated by the person supervising the pull.

- a. Site layout drawing with cable pulls numerically identified.
- b. A list of equipment used, with calibration certifications. The manufacturer and quantity of lubricant used on pull.
- c. The cable manufacturer and type of cable.

d. The dates of cable pulls, time of day, and ambient temperature.

e. The length of cable pull and calculated cable pulling tensions.

f. The actual cable pulling tensions encountered during pull.

SD-07 Certificates

Material and Equipment;

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

Cable Joints; G,

A certification that contains the names and the qualifications of people recommended to perform the splicing and termination of medium-voltage cables approved for installation under this contract. The certification shall indicate that any person recommended to perform actual splicing and terminations has been adequately trained in the proper techniques and have had at least three recent years of experience in splicing and terminating the same or similar types of cables approved for installation. In addition, any person recommended by the Contractor may be required to perform a practice splice and termination, in the presence of the Contracting Officer, before being approved as a qualified installer of medium-voltage cables. If that additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables along with the approved type of splice and termination kits, and detailed manufacturer's instruction for the proper splicing and termination of the approved cable types.

Cable Installer Qualifications; G,

The Contractor shall provide at least one onsite person in a

supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. A resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

SD-10 Operation and Maintenance Data

Electrical Distribution System;

Six copies of operation and maintenance manuals, within 7 calendar days following the completion of tests and including assembly, installation, operation and maintenance instructions, spare parts data which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked. Manuals shall also include data outlining detailed procedures for system startup and operation, and a troubleshooting guide which lists possible operational problems and corrective action to be taken. A brief description of all equipment, basic operating features, and routine maintenance requirements shall also be included. Documents shall be bound in a binder marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

Three additional copies of the instructions manual shall be provided within 30 calendar days following the manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements.

1.5 EXTRA MATERIALS

One additional spare fuse or fuse element for each furnished fuse or fuse element shall be delivered to the contracting officer when the electrical system is accepted. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 NAMEPLATES

2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a nameplate securely attached to the equipment. Nameplates shall be made of noncorrosive metal. Equipment containing liquid dielectrics shall have the type of dielectric on the nameplate. Sectionalizer switch nameplates shall have a schematic with all switch positions shown and labeled. As a minimum, nameplates shall be provided for transformers and switches.

2.2.2 Liquid-Filled Transformer Nameplates

Power transformers will be provided with nameplate information in accordance with IEEE C57.12.00. Nameplates shall indicate the number of gallons and composition of liquid-dielectric, and shall be permanently marked with a statement that the transformer dielectric to be supplied is non-polychlorinated biphenyl.

2.3 CORROSION PROTECTION

2.3.1 Aluminum Materials

Aluminum will not be used.

2.3.2 Ferrous Metal Materials

2.3.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153/A 153M and ASTM A 123/A 123M.

2.3.2.2 Equipment

Equipment and component items, including but not limited to transformer stations and ferrous metal luminaries not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 480 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The scribed test mark and test evaluation shall be in accordance with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

2.3.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTS AND COATINGS.

2.4 CABLES

Cables shall be single conductor type unless otherwise indicated.

2.4.1 Medium-Voltage Cables

2.4.1.1 General

Cable construction shall be Type MV, conforming to NFPA 70 and UL 1072 . Cables shall be manufactured for use in direct burial applications as indicated.

2.4.1.2 Ratings

Cables shall be rated for a circuit voltage of 5 kV.

2.4.1.3 Conductor Material

Underground cables shall be soft drawn copper complying with ASTM B 3 and ASTM B 8 for regular concentric and compressed stranding or ASTM B 496 for compact stranding.

2.4.1.4 Insulation

Cable insulation shall be ethylene-propylene-rubber (EPR) insulation conforming to the requirements of NEMA WC 8 and AEIC CS6. A 133 percent insulation level shall be used on 5 kV, 15 kV and 25 kV rated cables. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

2.4.1.5 Shielding

Cables rated for 2 kV and above shall have a semiconducting conductor shield, a semiconducting insulation shield, and an overall copper tape shield for each phase. The shield tape shall be sized to meet IEEE C2 requirements for a ground fault availability of 5000 amperes.

2.4.1.6 Neutrals

Neutral conductors shall be copper, employing the same insulation and jacket materials as phase conductors, except that a 600-volt insulation rating is acceptable.

2.4.1.7 Jackets

Cables shall be provided with a PVC or polyethylene jacket. Direct buried cables shall be rated for direct burial.

2.4.2 Low-Voltage Cables

Cables shall be rated 600 volts and shall conform to the requirements of NFPA 70, and must be UL listed for the application or meet the applicable section of either ICEA or NEMA standards.

2.4.2.1 Conductor Material

Underground cables shall be annealed copper complying with ASTM B 3 and ASTM B 8. Intermixing of copper and aluminum conductors is not permitted.

2.4.2.2 Insulation

Insulation must be in accordance with NFPA 70, and must be UL listed for the application or meet the applicable sections of either ICEA, or NEMA standards.

2.4.2.3 Direct Buried

Single and multi-conductor cables shall of a type identified for direct burial. Service entrance cables shall conform to UL 854 for Type USE service entrance cable.

2.5 CABLE JOINTS, TERMINATIONS, AND CONNECTORS

2.5.1 Medium-Voltage Cable Joints

Medium-voltage cable joints shall comply with IEEE Std 404 and IEEE Std 592.

Medium-voltage cable terminations shall comply with IEEE Std 48. Joints shall be the standard products of a manufacturer and shall be either of the factory preformed type or of the kit type containing tapes and other required parts. Joints shall have ratings not less than the ratings of the cables on which they are installed. Splice kits may be of the heat-shrinkable type for voltages up to 15 kV, of the premolded splice and connector type, the conventional taped type, or the resin pressure-filled overcast taped type for voltages up to 35 kV; except that for voltages of 7.5 kV or less a resin pressure-filled type utilizing a plastic-tape mold is acceptable. Joints used in manholes, handholes, vaults and pull boxes shall be certified by the manufacturer for waterproof, submersible applications.

2.5.2 Medium-Voltage Separable Insulated Connectors

Separable insulated connectors shall comply with IEEE Std 386 and IEEE Std 592 and shall be of suitable construction or standard splice kits shall be used. Separable insulated connectors are acceptable for voltages up to 35 kV. Connectors shall be of the loadbreak type as indicated, of suitable construction for the application and the type of cable connected, and shall include cable shield adaptors. Separable insulated connectors shall not be used as substitutes for conventional permanent splices. External clamping points and test points shall be provided.

2.5.3 Low-Voltage Cable Splices

Low-voltage cable splices and terminations shall be rated at not less than 600 Volts. Splices in conductors No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A. Splices in conductors No. 8 AWG and larger shall be made with noninsulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A. Splices shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

2.5.4 Terminations

Terminations shall be in accordance with IEEE Std 48, Class 1 or Class 2; of the molded elastomer type. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors shall be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations shall be of the

outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

2.5.4.1 Factory Preformed Type

Molded elastomer shall utilize factory preformed components to the maximum extent practicable. Terminations shall have basic impulse levels as required for the system voltage level.

2.6 CONDUIT AND DUCTS

2.6.1 Metallic Conduit

Intermediate metal conduit shall comply with UL 1242. Rigid galvanized steel conduit shall comply with UL 6 and ANSI C80.1. Metallic conduit fittings and outlets shall comply with UL 514A and NEMA FB 1.

2.6.2 Nonmetallic Ducts

2.6.2.1 Concrete Encased Ducts PVC

UL 651 Schedule 40 or NEMA TC 6 Type EB.

2.6.2.2 Direct Burial PVC

UL 651 as indicated, or NEMA TC 6 Type DB.

2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.7 TRANSFORMERS AND SWITCHGEAR

Transformers and switchgear shall be of the outdoor type having the ratings and arrangements indicated. Medium-voltage ratings of cable terminations shall be 5 kV between phases for 133 percent insulation level.

2.7.1 Pad-Mounted Transformers

Pad-mounted transformers shall comply with 16273N "Single Phase Pad-Mounted Transformers".

2.7.2 Pad-Mounted, Metal-Enclosed, Switchgear

The switchgear shall be configured with air-insulated, load-interrupter switches as indicated. Unfused ways shall be three pole ganged operated.

Fused ways shall be single pole.

2.7.2.1 Ratings at 60 Hz shall be:

Nominal voltage (kV).....	14.4.
Rated maximum voltage (kV).....	17.
Rated continuous current (A).....	600.
Live Switching/Load Dropping	600.
Live Switching/Load Splitting.....	600.
Duty Cycle Fault Closing 2-Time (Asym) (kA).....	22.4.
Momentary (Asym) (kA).....	22.4.
One Second (Sym) (kA).....	14.
BIL (kV).....	95.

2.7.2.2 Operators, Devices, and Controls

Operators and controls shall be provided for the switchgear as follows:

- a. Switches shall be provided with a manual, handle-type operator or a push-button mechanical spring tripping mechanism, utilizing a stored-energy (spring-driven) mechanism to simultaneously open or close all phases. The switchgear shall be configured so that the switch actuator is padlockable, but may be accessed without opening the switch compartment doors.
- b. Fused disconnects shall be hook-stick operated.

2.7.2.3 Enclosures

Switchgear enclosure shall be of freestanding, self-supporting construction provided with separate incoming and outgoing compartments configured for bottom cable entry. Provide 12" high base spacer unit to increase cable termination height. Enclosure and base unit shall be stainless steel painted olive green. Enclosures shall be provided with a hinged door for access to each compartment, and conform to the requirements of ANSI C57.12.28, ANSI C37.72, and IEEE C37.20.3, Category A.

2.8 METERING AND PROTECTIVE DEVICES

2.8.1 Circuit Breakers, Low-Voltage

2.8.1.1 Molded-Case Circuit Breakers

NEMA AB 1 and UL 489.

2.8.2 Fuses, Medium-Voltage, Including Current-Limiting

2.8.2.1 Construction

Units shall be suitable for outdoor use. Fuses shall have integral blown-fuse indicators. All ratings shall be clearly visible.

2.8.2.2 Ratings

Current-limiting power fuses shall have ratings in accordance with ANSI C37.46 and as follows:

Nominal voltage.....14.4KV.

Rated maximum voltage.....17.0KV.

Maximum symmetrical interrupting capacity.....13,000A.

Rated continuous current.....200A.

2.8.2.3 E-Rated, Current-Limiting Power Fuses

E-rated, current-limiting, power fuses shall conform to ANSI C37.46.

2.8.2.4 C-Rated, Current-Limiting Power Fuses

C-rated, current-limiting power fuses shall open in 1000 seconds at currents between 170 and 240 percent of the C rating.

2.9 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1, IEEE C62.1, IEEE C62.2, and IEEE C62.11 and shall be provided where indicated. Arresters shall be distribution class, rated as shown. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the metal-oxide varistor or combination valve-metal-oxide varistor type.

2.10 GROUNDING AND BONDING

2.10.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to UL 467 not less than 5/8 inch in diameter by 10 feet in length. Sectional type rods may be used.

2.10.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

2.11 CONCRETE

Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of Section 03307A Concrete for Minor Structures.

2.12 PADLOCKS

Padlocks shall comply with Section 08710 DOOR HARDWARE.

2.13 CABLE FIREPROOFING SYSTEMS

Cable fireproofing systems shall be listed in FM P7825a as a fire-protective coating or tape approved for grouped electrical conductors and shall be suitable for application on the type of medium-voltage cables provided. After being fully cured, materials shall be suitable for use where exposed to oil, water, gases, salt water, sewage, and fungus and shall not damage cable jackets or insulation. Asbestos materials are not acceptable.

2.13.1 Fireproof Coating

Cable fireproofing coatings shall be compounded of water-based thermoplastic resins, flame-retardant chemicals, and inorganic noncombustible fibers and shall be suitable for the application methods used. Coatings applied on bundled cables shall have a derating factor of less than 5 percent, and a dielectric strength of 95 volts per mil minimum after curing.

2.13.2 Fireproofing Tape

Fireproofing tape shall be at least 2 inches wide and shall be a flexible, conformable, polymeric, elastomer tape designed specifically for fireproofing cables.

2.13.3 Plastic Tape

Preapplication plastic tape shall be pressure sensitive, 10 mil thick, conforming to UL 510.

2.14 LIQUID DIELECTRICS

Liquid dielectrics for transformers and other liquid-filled electrical equipment shall be non-polychlorinated biphenyl (PCB) mineral-oil or less-flammable liquid as specified. Nonflammable fluids shall not be used.

Tetrachloroethylene (perchloroethylene) and 1, 2, 4 trichlorobenzene fluids shall not be used. Liquid dielectrics in retrofitted equipment shall be certified by the manufacturer as having less than 50 parts per million (ppm) PCB content. In lieu of the manufacturer's certification, the Contractor may submit a test sample of the dielectric in accordance with ASTM D 923 and have tests performed per ASTM D 4059 at a testing facility approved by the Contracting Officer. Equipment with test results indicating PCB level exceeding 50 ppm shall be replaced.

2.15 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing. The Contracting Officer reserves the right to witness the tests.

- a. High-Voltage Air Switches: Manufacturer's standard tests in accordance with IEEE C37.34 and IEEE C37.41.
- b. Factory Preformed Terminations: Wet withstand voltage tests in accordance with IEEE Std 48 for the next higher BIL level.

- c. Outdoor Switchgear: Manufacturer's standard tests in accordance with IEEE C37.20.1, IEEE C37.20.2, and IEEE C37.20.3.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Steel conduits installed underground shall be installed and protected from corrosion in conformance with the requirements of Section 16415A ELECTRICAL WORK, INTERIOR. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02316A EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of Section 03307A Concrete for Minor Structures.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

3.1.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

3.2 CABLE INSTALLATION

The Contractor shall obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, etc. The Contractor shall then perform pulling calculations and prepare a pulling plan which shall be submitted along with the manufacturers instructions in accordance with SUBMITTALS.

3.2.1 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, handhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

3.2.1.1 Cable Inspection

The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

3.2.1.2 Duct Cleaning

Duct shall be cleaned with an assembly that consists of a flexible mandrel (manufacturers standard product in lengths recommended for the specific size and type of duct) that is 1/4 inch less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of 2 times or until less than a volume of 8 cubic inches of debris is expelled from the duct.

3.2.1.3 Duct Lubrication

The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance with lubricant manufacturer's recommendations.

3.2.1.4 Cable Installation

The Contractor shall provide a cable feeding truck and a cable pulling winch as required. The Contractor shall provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manilla rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. The Contractor shall not allow cables to cross over while cables are being fed into duct. For cable installation in cold weather, cables shall be kept at 50 degrees F temperature for at least 24 hours before installation.

3.2.1.5 Cable Installation Plan

The Contractor shall submit a cable installation plan for all cable pulls in accordance with the detail drawings portion of paragraph SUBMITTALS. Cable installation plan shall include:

- a. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.
- b. List of cable installation equipment.
- c. Lubricant manufacturer's application instructions.
- d. Procedure for resealing cable ends to prevent moisture from entering cable.
- e. Cable pulling tension calculations of all cable pulls.
- f. Cable percentage conduit fill.
- g. Cable sidewall thrust pressure.
- h. Cable minimum bend radius and minimum diameter of pulling wheels used.
- i. Cable jam ratio.
- j. Maximum allowable pulling tension on each different type and size of conductor.
- k. Maximum allowable pulling tension on pulling device.

3.2.2 Duct Line

Medium-voltage cables shall be installed in duct lines where indicated. Cable joints in medium-voltage cables shall be made in manholes or approved pullboxes only. Neutral and grounding conductors shall be installed in the same duct with their associated phase conductors.

3.2.3 Direct-Burial

Low-voltage cables shall be buried directly in the earth as indicated. Minimum cover from the top of a cable to finished grade shall be 30 inches, but not less than the depth of the frost line.

3.2.3.1 Trenching

Trenches for direct-burial cables shall be excavated to depths required to provide the minimum necessary cable cover. Bottoms of trenches shall be smooth and free of stones and sharp objects. Where bottoms of trenches comprise materials other than sand, a 3 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil.

3.2.3.2 Cable Burial

Cables shall be unreeled along the sides of or in trenches and carefully placed on sand or earth bottoms. Pulling cables into direct-burial trenches from a fixed reel position will not be permitted, except as required to pull cables through conduits under paving or railroad tracks. Where cables cross, a separation of at least 3 inches shall be provided, unless each cable circuit is protected by a nonmetallic conduit sleeve at the crossing. Where single-conductor cable is installed, all 3 phases and the neutral shall be installed in the same sleeve. Bend radius of any cable shall be not less than 8 times the diameter of the cable. In no case shall cables be left under longitudinal tension. The first 6 inch layer of backfill shall be of sand. Machine compaction shall not be used within 6 inches of the cable.

3.2.3.3 Other Requirements

Where direct-burial cables cross under roads or other paving exceeding 5 feet in width, such cables shall be installed in concrete-encased ducts. Ducts shall extend at least 1 foot beyond each edge of any paving. Cables may be pulled into duct from a fixed reel where suitable rollers are provided in the trench. Where direct burial cable transitions to duct-enclosed cable, direct-burial cables shall be centered in duct entrances, and a waterproof nonhardening mastic compound shall be used to facilitate such centering. If paving is in place where cables are to be installed, coated rigid steel conduits driven under the paving or railroad tracks may be used in lieu of concrete-encased ducts. Damage to conduit coatings shall be prevented by providing ferrous pipe jackets or by predrilling. Where cuts are made in any paving, the paving and subbase shall be restored to their original condition.

3.2.3.4 Medium-Voltage Cable Joints or Low-Voltage Cable Splices

Cable joints or splices in direct-burial cables are not permitted in runs of 1000 feet or less, nor at intervals of less than 1000 feet in longer runs, except as required for taps. Locations of cable joints or splices in shorter intervals, where required to avoid obstructions or damage to cables, shall be approved. Building service laterals shall be run

continuous without splices. Cable joints or splices in duct banks shall be made only in manholes, handholes, or pullboxes.

3.2.4 Electric Manholes

Cables shall be routed around the interior walls and securely supported from walls on cables racks. Cable routing shall minimize cable crossover, provide access space for maintenance and installation of additional cables, and maintain cable separation in accordance with IEEE C2.

3.3 CABLE JOINTS

Medium-voltage cable joints shall be made by qualified cable splicers only. Qualifications of cable splicers shall be submitted in accordance with paragraph SUBMITTALS. Shields shall be applied as required to continue the shielding system through each entire cable joint. Shields may be integrally molded parts of preformed joints. Shields shall be grounded at each joint or in accordance with manufacturer's recommended practice. Cable joints shall provide insulation and jacket equivalent to that of the associated cable.

3.4 FIREPROOFING

Each medium-voltage cable and conductor in manholes shall be fire-proofed for their entire length within the manhole. Where cables and conductors have been lubricated to enhance pulling into ducts, the lubricant shall be removed from cables and conductors exposed in the manhole before fireproofing. Fire-stops shall be installed in each conduit entering or leaving a manhole.

3.4.1 Tape Method

Before application of fireproofing tape, plastic tape wrapping shall be applied over exposed metallic items such as the cable ground wire, metallic outer covering, or armor to minimize the possibility of corrosion from the fireproofing materials and moisture. Before applying fireproofing tape, irregularities of cables, such as at cable joints, shall be evened out with insulation putty. A flexible conformable polymeric elastomer fireproof tape shall be wrapped tightly around each cable spirally in 1/2 lapped wrapping or in 2 butt-jointed wrappings with the second wrapping covering the joints of the first.

3.4.2 Sprayable Method

Manholes shall be power ventilated until coatings are dry and dewatered and the coatings are cured. Ventilation requirements shall be in accordance with the manufacturer's instruction, but not less than 10 air changes per hour shall be provided. Cable coatings shall be applied by spray, brush, or glove to a wet film thickness that reduces to the dry film thickness approved for fireproofing by FM P7825a. Application methods and necessary safety precautions shall be in accordance with the manufacturers instructions. After application, cable coatings shall be dry to the touch in 1 to 2 hours and fully cured in 48 hours, except where the manufacturer has stated that because of unusual humidity or temperature, longer periods may be necessary.

3.5 DUCT LINES

3.5.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in manholes or handholes.

3.5.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.5.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70. The separation between adjacent electric power and communication ducts shall conform to IEEE C2. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. The Contractor shall submit proposed bonding method for approval in accordance with the detail drawing portion of paragraph SUBMITTALS. At any point, tops of concrete encasements shall be not less than the cover requirements listed in NFPA 70. Where ducts are jacked under existing pavement, rigid steel conduit will be installed because of its strength. To protect the corrosion-resistant conduit coating, predrilling or installing conduit inside a larger iron pipe sleeve (jack-and-sleeve) is required. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

3.5.4 Nonencased Direct-Burial

Top of duct lines shall be below the frost line depth of 30 inches, but not less than 30 inches below finished grade and shall be installed with a minimum of 3 inches of earth around each duct, except that between adjacent electric power and communication ducts, 12 inches of earth is required. Bottoms of trenches shall be graded toward manholes or handholes and shall be smooth and free of stones, soft spots, and sharp objects. Where bottoms of trenches comprise materials other than sand, a 3 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil before installing ducts. Joints in adjacent tiers of duct shall

be vertically staggered at least 6 inches. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in 3 to 6 inch layers. Duct banks may be held in alignment with earth. However, high-tiered banks shall use a wooden frame or equivalent form to hold ducts in alignment prior to backfilling.

3.5.5 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

3.5.5.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

3.6 PAD-MOUNTED EQUIPMENT INSTALLATION

Pad-mounted equipment, shall be installed on concrete pads in accordance with the manufacturer's published, standard installation drawings and procedures, except that they shall be modified to meet the requirements of this document. Units shall be installed so that they do not damage equipment or scratch painted or coated surfaces. After installation, surfaces shall be inspected and scratches touched up with a paint or coating provided by the manufacturer especially for this purpose.

3.6.1 Concrete Pads

3.6.1.1 Construction

Concrete pads for pad-mounted electrical equipment shall be poured-in-place. Pads shall be constructed as indicated, except that exact pad dimensions and mounting details are equipment specific and are the responsibility of the Contractor. Tops of concrete pads shall be level and shall project 4 inches above finished paving or grade and sloped to drain. Edges of concrete pads shall have 3/4 inch chamfer. Conduits for primary, secondary, and grounding conductors shall be set in place prior to placement of concrete pads. Where grounding electrode conductors are installed through concrete pads, PVC conduit sleeves shall be installed through the concrete to provide physical protection. To facilitate cable installation and termination, the concrete pad shall be provided with a rectangular hole below the primary and secondary compartments, sized in accordance with the manufacturer's recommended dimensions. Upon completion of equipment installation the rectangular hole shall be filled with masonry grout.

3.6.1.2 Concrete

Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of Section 03307A Concrete for Minor Structures.

3.6.1.3 Sealing

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing

compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.6.2 Padlocks

Padlocks shall be provided for pad-mounted equipment . Padlocks shall be keyed as directed by the Contracting Officer.

3.7 CONNECTIONS TO BUILDINGS

Cables shall be extended into the various buildings as indicated, and shall be connected to the first applicable termination point in each building. Interfacing with building interior systems shall be at conduit stubouts outside of a building as specified and provided under Section 16415A ELECTRICAL WORK, INTERIOR. After installation of cables, conduits shall be sealed to prevent entrance of moisture or gases into buildings.

3.8 GROUNDING

A ground ring consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed around pad-mounted equipment as shown. Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable shields, cable sheaths, and metallic conduit shall be grounded. At least 2 connections shall be provided from a transformer, a switchgear ground bus to the ground mat.

3.8.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as follows:

- a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.
- b. Ground ring - A ground ring shall be installed as shown consisting of bare copper conductors installed 12 inches, plus or minus 3 inches, below finished top of soil grade. Ground ring conductors shall be sized as shown.
- c. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance. The additional electrodes will be up to three, 8 feet rods spaced a minimum of 10 feet apart. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

3.8.2 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

3.8.3 Grounding and Bonding Conductors

Grounding and bonding conductors include conductors used to bond transformer enclosures and equipment frames to the grounding electrode system. Grounding and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

3.8.4 Surge Arrester Grounding

Surge arresters and neutrals shall be bonded directly to the transformer enclosure and then to the grounding electrode system with a bare copper conductor, sized as shown. Lead lengths shall be kept as short as practicable with no kinks or sharp bends.

3.8.5 Manhole, Handhole, or Concrete Pullbox Grounding

Ground rods in manholes, handholes, or concrete pullboxes shall be connected to cable racks, the cable shielding at each cable joint or splice by means of a No. 4 AWG braided tinned copper wire. Connections to metallic cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Grounding electrode conductors shall be neatly and firmly attached to manhole or handhole walls and the amount of exposed bare wire shall be held to a minimum.

3.9 FIELD TESTING

3.9.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 10 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field test reports shall be signed and dated by the Contractor.

3.9.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.9.3 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using

the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Single rod electrode - 5 ohms.
- b. Multiple rod electrodes - 5 ohms.
- c. Ground ring - 5 ohms.

3.9.4 Ground-Mat Connection Inspection

All below-grade ground-mat connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 24 hours before the site is ready for inspection.

3.9.5 Medium-Voltage Cable Test

After installation and before the operating test or connection to an existing system, the medium-voltage cable system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shieldings or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with NEMA WC 7 or NEMA WC 8 for the particular type of cable installed, except that 28 kV and 35 kV insulation test voltages shall be in accordance with either AEIC CS5 or AEIC CS6 as applicable, and shall not exceed the recommendations of IEEE Std 404 for cable joints and IEEE Std 48 for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the Contractor shall make necessary repairs or replace cables as directed. Repaired or replaced cables shall be retested.

3.9.6 Low-Voltage Cable Test

Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet})$

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

3.9.7 Pre-Energization Services

Calibration, testing, adjustment, and placing into service of the installation shall be accomplished by a manufacturer's product field service engineer or independent testing company with a minimum of 2 years of current product experience. The following services shall be performed on the equipment listed below. These services shall be performed subsequent to testing but prior to the initial energization. The equipment shall be inspected to ensure that installation is in compliance with the recommendations of the manufacturer and as shown on the detail drawings. Terminations of conductors at major equipment shall be inspected to ensure the adequacy of connections. Bare and insulated conductors between such terminations shall be inspected to detect possible damage during installation. If factory tests were not performed on completed assemblies, tests shall be performed after the installation of completed assemblies. Components shall be inspected for damage caused during installation or shipment to ensure packaging materials have been removed. Components capable of being both manually and electrically operated shall be operated manually prior to the first electrical operation. Components capable of being calibrated, adjusted, and tested shall be calibrated, adjusted, and tested in accordance with the instructions of the equipment manufacturer. Items for which such services shall be provided, but are not limited to, are the following:

- a. Pad-mounted transformers
- b. Metal-enclosed switchgear

3.9.8 Operating Tests

After the installation is completed, and at such times as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

3.10 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

-- End of Section --

SECTION 16415A

ELECTRICAL WORK, INTERIOR
08/96

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C78.1	(1991; C78.1a; R 1996) Fluorescent Lamps - Rapid-Start Types - Dimensional and Electrical Characteristics
ANSI C78.20	(1995) Electric Lamps - Characteristics of Incandescent Lamps A, G, PS, and Similar Shapes with E26 Medium Screw Bases
ANSI C78.21	(1995) Physical and Electrical Characteristics - Incandescent Lamps - PAR and R Shapes
ANSI C82.1	(1997) Specifications for Fluorescent Lamp Ballasts

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 1	(1995) Hard-Drawn Copper Wire
ASTM B 8	(1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 709	(1992; R 1997) Laminated Thermosetting Materials

CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 18	Industrial, Scientific, and Medical Equipment
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INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1	(1993) Molded Case Circuit Breakers and Molded Case Switches
NEMA FU 1	(1986) Low Voltage Cartridge Fuses
NEMA ICS 1	(1993) Industrial Control and Systems
NEMA ICS 2	(1993) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC
NEMA ICS 3	(1993) Industrial Control and Systems Factory Built Assemblies
NEMA ICS 6	(1993) Industrial Control and Systems Enclosures
NEMA MG 1	(1993; Rev 1; Rev 2; Rev 3; Rev 4) Motors and Generators
NEMA MG 10	(1994) Energy Management Guide for Selection and Use of Polyphase Motors
NEMA OS 1	(1996) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
NEMA OS 2	(1986; Errata Aug 1986; R 1991) Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
NEMA PB 1	(1995) Panelboards
NEMA RN 1	(1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 2	(1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA WD 1	(1983; R 1989) General Requirements for Wiring Devices
NEMA WD 6	(1988) Wiring Devices - Dimensional Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code
NFPA 101	(1997; Errata 97-1; TIA 97-1) Life Safety Code

UNDERWRITERS LABORATORIES (UL)

UL 1	(1993; Rev thru Jan 1995) Flexible Metal Conduit
UL 5	(1996) Surface Metal Raceways and Fittings

UL 6	(1997) Rigid Metal Conduit
UL 20	(1995; Rev thru Oct 1998) General-Use Snap Switches
UL 50	(1995; Rev thru Oct 1997) Enclosures for Electrical Equipment
UL 67	(1993; Rev thru Nov 1995) Panelboards
UL 83	(1998) Thermoplastic-Insulated Wires and Cables
UL 98	(1994; R thru Jun 1998) Enclosed and Dead-Front Switches
UL 198B	(1995) Class H Fuses
UL 198C	(1986; Rev thru Feb 1998) High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198D	(1995) Class K Fuses
UL 198E	(1988; Rev Jul 1988) Class R Fuses
UL 198G	(1988; Rev May 1988) Fuses for Supplementary Overcurrent Protection
UL 360	(1996; Rev thru Oct 1997) Liquid-Tight Flexible Steel Conduit
UL 467	(1993; Rev thru Aug 1996) Grounding and Bonding Equipment
UL 486A	(1997; Rev thru Dec 1998) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486C	(1997; Rev thru Aug 1998) Splicing Wire Connectors
UL 486E	(1994; Rev thru Feb 1997) Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
UL 489	(1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 498	(1996; Rev thru Sep 1998) Attachment Plugs and Receptacles
UL 508	(1999) Industrial Control Equipment
UL 510	(1994; Rev thru Apr 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape

UL 512	(1993; R Dec 1995) Fuseholders
UL 514A	(1996; Rev Jul 1998) Metallic Outlet Boxes
UL 514B	(1997; Rev Oct 1998) Fittings for Cable and Conduit
UL 514C	(1996; R Sep 1998) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 542	(1994; Rev thru Jul 1998) Lampholders, Starters, and Starter Holders for Fluorescent Lamps
UL 651	(1995; Rev thru Oct 1998) Schedule 40 and 80 Rigid PVC Conduit
UL 651A	(1995; Rev thru Apr 1998) Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 719	(1999) Nonmetallic-Sheathed Cables
UL 797	(1993; Rev thru Mar 1997) Electrical Metallic Tubing
UL 817	(1994; Rev thru Jul 1998) Cord Sets and Power-Supply Cords
UL 854	(1996; Rev Apr 1998) Service-Entrance Cables
UL 869A	(1998) Reference Standard for Service Equipment
UL 935	(1995; Rev thru Oct 1998) Fluorescent-Lamp Ballasts
UL 943	(1993; Rev thru May 1998) Ground-Fault Circuit-Interrupters
UL 1004	(1994; Rev thru Dec 1997) Electric Motors
UL 1242	(1996; Rev Mar 1998) Intermediate Metal Conduit
UL 1569	(1995; Rev thru Sep 1998) Metal-Clad Cables
UL 1570	(1995; Rev thru Jun 1997) Fluorescent Lighting Fixtures
UL 1571	(1995; Rev thru Jun 1997) Incandescent Lighting Fixtures
UL Elec Const Dir	(1998) Electrical Construction Equipment Directory

1.2 GENERAL

1.2.1 Rules

The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated or shown.

1.2.2 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment shall be properly located and readily accessible.

Lighting fixtures, outlets, and other equipment and materials shall be carefully coordinated with mechanical or structural features prior to installation and positioned according to architectural reflected ceiling plans; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. The Contractor shall coordinate the electrical requirements of the mechanical work and provide all power related circuits, wiring, hardware and structural support, even if not shown on the drawings.

1.2.3 Special Environments

1.2.3.1 Weatherproof Locations

Wiring, Fixtures, and equipment in designated locations shall conform to NFPA 70 requirements for installation in damp or wet locations.

1.2.3.2 Ducts, Plenums and Other Air-Handling Spaces

Wiring and equipment in ducts, plenums and other air-handling spaces shall be installed using materials and methods in conformance with NFPA 70 unless more stringent requirements are indicated in this specification or on the contract drawings.

1.2.4 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.2.5 Nameplates

1.2.5.1 Identification Nameplates

Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Unless otherwise specified, identification nameplates shall be made of laminated plastic in accordance with ASTM D 709 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws, except motors, or approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular-shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and

nameplates. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 1/4 inch
High Letters

Panelboards

Each panel, section, or unit shall be provided with a nameplate in addition to nameplates listed above.

1.2.6 As-Built Drawings

Following the project completion or turnover, within 30 days the Contractor shall furnish 2 sets of as-built drawings to the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Interior Electrical Equipment; G.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams, and other information necessary to define the installation. Detail drawings shall show the rating of items and systems and how the components of an item and system are assembled, function together, and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall show physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. Optional items shall be clearly identified as included or excluded.

Electrical drawings including single-line and three-line diagrams, and schematics or elementary diagrams of each electrical system; internal wiring and field connection diagrams of each electrical device when published by the manufacturer; wiring diagrams of cabinets, panels, units, or separate mountings; interconnection diagrams that show the wiring between separate

components of assemblies; field connection diagrams that show the termination of wiring routed between separate items of equipment; internal wiring diagrams of equipment showing wiring as actually provided for this project. Field wiring connections shall be clearly identified.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures, including changes in related portions of the project and the reasons why, shall be submitted with the detail drawings. Approved departures shall be made at no additional cost to the Government.

SD-03 Product Data

Manufacturer's Catalog; G.

Data composed of catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists; G.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each item.

Installation Procedures; G.

Installation procedures as necessary to demonstrate proper installation. Procedures shall include diagrams, instructions, and precautions required to install, adjust, calibrate, and test devices and equipment.

As-Built Drawings; G.

The as-built drawings shall be a record of the construction as installed. The drawings shall include all the information shown on the contract drawings, deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be kept at the job site and updated daily. The as-built drawings shall be a full-sized set of prints marked to reflect all deviations, changes, and modifications. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall submit three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within ten calendar days from the time the drawings are returned to the Contractor.

Onsite Tests; G .

A detailed description of the Contractor's proposed procedures for on-site tests.

SD-06 Test Reports

Factory Test Reports; G .

Six copies of the information described below in 8 1/2 x 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The conditions specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.

Field Test Plan; G, .

A detailed description of the Contractor's proposed procedures for onsite test submitted 30 days prior to testing the installed system. No field test will be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Field Test Reports; G, .

Six copies of the information described below in 8 1/2 x 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The conditions specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.

h. Final position of controls and device settings.

SD-07 Certificates

Materials and Equipment; FIO.

The label or listing of the Underwriters Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements will be accepted. Items which are required to be listed and labeled in accordance with Underwriters Laboratories must be affixed with a UL label that states that it is UL listed. No exceptions or waivers will be granted to this requirement. Materials and equipment will be approved based on the manufacturer's published data.

For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

1.4 WORKMANSHIP

Materials and equipment shall be installed in accordance with NFPA 70, recommendations of the manufacturer, and as shown.

PART 2 PRODUCTS

Products shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.1 CABLES AND WIRES

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. Conductor sizes and ampacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.

2.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to meet manufacturer's requirements.

2.1.2 Aluminum Conductors

Aluminum conductors shall not be used.

2.1.3 Insulation

Unless indicated otherwise, or required by NFPA 70, power and lighting wires shall be 600-volt, Type THWN, THHN, or THW conforming to UL 83, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits shall be Type TW, THW or TF, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.1.4 Bonding Conductors

ASTM B 1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B 8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.1.5 Service Entrance Cables

Service entrance (SE) and underground service entrance (USE) cables, UL 854.

2.1.6 Non-metallic Sheathed Cable

UL 719, type NM or NMC.

2.1.7 Metal-Clad Cable

UL 1569; NFPA 70, Type MC cable.

2.1.8 Cord Sets and Power-Supply Cords

UL 817.

2.2 METER CENTER

IEEE C12.7. Provide service entrance approved, NEMA Type 3R, box-mounted socket, ringless type, having 5 jaws for single phase or 7 jaws for three phase meter sockets for future self contained watthour meters. Provide indicated circuit breakers, gray plastic closing covers and bypass links. Provide manufacturers standard enclosure color unless otherwise indicated.

2.3 CIRCUIT BREAKERS

2.3.1 MOLDED-CASE CIRCUIT BREAKERS

Molded-case circuit breakers shall conform to NEMA AB 1 and UL 489. Breaker terminals shall be UL listed as suitable for type of conductor provided. Half-size and tandem breakers are not acceptable. 15 and 20 ampere breakers shall be switch duty rated. Breakers shall not require use of panel trim to secure them to the bus. Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes all poles to open.

2.3.1.1 Construction

Circuit breakers shall be suitable for mounting and operating in any position. Lug shall be listed for copper and aluminum conductors in accordance with UL 486E. Single-pole circuit breakers shall be full module size with not more than one pole per module. Multi-pole circuit breakers shall be of the common-trip type having a single operating handle such that an overload or short circuit on any one pole will result in all poles

opening simultaneously. Sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multi-pole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. All circuit breakers shall have a quick-make, quick-break overcenter toggle-type mechanism, and the handle mechanism shall be trip-free to prevent holding the contacts closed against a short-circuit or sustained overload. All circuit breaker handles shall assume a position between "ON" and "OFF" when tripped automatically. All ratings shall be clearly visible.

2.3.1.2 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. The interrupting rating of the circuit breakers shall be at least equal to the available short-circuit current at the line terminals of the circuit breaker and correspond to the UL listed integrated short-circuit current rating specified for the panelboards and switchboards. Molded-case circuit breakers shall have nominal voltage ratings, maximum continuous-current ratings, and maximum short-circuit interrupting ratings in accordance with NEMA AB 1. Ratings shall be coordinated with system X/R ratio.

2.3.1.3 Cascade System Ratings

Circuit breakers used in series combinations shall be in accordance with UL 489. Equipment, such as switchboards and panelboards, which house series-connected circuit breakers shall be clearly marked accordingly. Series combinations shall be listed in the UL Recognized Component Directory under "Circuit Breakers-Series Connected."

2.3.1.4 Thermal-Magnetic Trip Elements

Thermal magnetic circuit breakers shall be provided as shown. Automatic operation shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. The instantaneous magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes above 225 amperes.

2.3.2 HACR Circuit Breakers

Circuit breakers 60 amperes or below, 240 volts, 1-pole or 2-pole, intended to protect multi-motor and combination-load installations involved in heating, air conditioning, and refrigerating equipment shall be marked "Listed HACR Type."

2.3.3 Ground Fault Circuit Interrupters

UL 943. Breakers equipped with ground fault circuit interrupters shall have ground fault class, interrupting capacity, and voltage and current ratings as indicated.

2.4 CONDUIT AND TUBING

2.4.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797

2.4.2 Flexible Conduit, Steel

General-purpose type, UL 1; liquid tight, UL 360.

2.4.3 Intermediate Metal Conduit

UL 1242.

2.4.4 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.4.5 Rigid Metal Conduit

UL 6.

2.4.6 Rigid Plastic Conduit

NEMA TC 2, UL 651 and UL 651A.

2.4.7 Surface Metal Electrical Raceways and Fittings

UL 5.

2.5 CONDUIT AND DEVICE BOXES AND FITTINGS

2.5.1 Boxes, Metallic Outlet

NEMA OS 1 and UL 514A.

2.5.2 Boxes, Nonmetallic, Outlet and Flush-Device Boxes and Covers

NEMA OS 2 and UL 514C.

2.5.3 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

2.5.4 Fittings for Conduit and Outlet Boxes

UL 514B.

2.5.5 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

2.6 CONDUIT COATINGS PLASTIC RESIN SYSTEM

NEMA RN 1, Type A-40.

2.7 CONNECTORS, WIRE PRESSURE

2.7.1 For Use With Copper Conductors

UL 486A.

2.8 ELECTRICAL GROUNDING AND BONDING EQUIPMENT

UL 467.

2.8.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 5/8 inch in diameter by 8 feet in length of the sectional type driven full length into the earth.

2.8.2 Ground Bus

The ground bus shall be bare conductor or flat copper in one piece, if practicable.

2.9 ENCLOSURES

NEMA ICS 6 unless otherwise specified.

2.9.1 Cabinets and Boxes

Cabinets and boxes with volume greater than 100 cubic inches shall be in accordance with UL 50, hot-dip, zinc-coated, if sheet steel.

2.9.2 Circuit Breaker Enclosures

UL 489.

2.10 LIGHTING FIXTURES, LAMPS, BALLASTS, CONTROLS AND ACCESSORIES

The following specifications are supported and supplemented by information and details on the drawings. Additional fixtures, if shown, shall conform to this specification. Lamps, lampholders, ballasts, transformers, electronic circuitry and other lighting system components shall be constructed according to industry standards. Equipment shall be tested and listed by a recognized independent testing laboratory for the expected installation conditions. Equipment shall conform to the standards listed below.

2.10.1 Lamps

Lamps shall be constructed to operate in the specified fixture, and shall function without derating life or output as listed in published data. Lamps shall meet the requirements of the Energy Policy Act of 1992.

- a. Incandescent and tungsten halogen lamps shall be designed for 125 volt operation (except for low voltage lamps), shall be rated for minimum life of 2,000 hours, and shall have color temperature between 2,800 and 3,200 degrees Kelvin. Tungsten halogen lamps shall incorporate quartz capsule construction. Lamps shall comply with ANSI C78.20 and sections 238 and 270 of ANSI C78.21.
- b. Fluorescent lamps shall have color temperature of 3500 degrees Kelvin. They shall be designed to operate with the ballasts and circuitry of the fixtures in which they will be used. Fluorescent lamps, including spares, shall be manufactured by one manufacturer to provide for color and performance consistency. Fluorescent lamps shall comply with ANSI C78.1.

(1) Linear fluorescent lamps, unless otherwise indicated, shall be of the length and wattage indicated with minimum CRI of 75. Lamps of other lengths or types shall be used only where specified or

shown. Lamps shall deliver rated life when operated on ballasts as shown.

2.10.2 Ballasts and Transformers

Ballasts or transformers shall be designed to operate the designated lamps within their optimum specifications, without derating the lamps. Lamp and ballast combinations shall be certified as acceptable by the lamp manufacturer.

- a. Low voltage incandescent transformers shall be Class II UL listed 120/12 volt or 120/24 volt step-down transformers as required for the lamps shown. Transformers shall be high power factor type and shall be rated for continuous operation under the specified load. Transformers shall be encased or encased and potted, and mounted integrally within the lighting fixture unless otherwise shown.
- b. Fluorescent ballasts shall comply with ANSI C82.1 and shall be mounted integrally within fluorescent fixture housing unless otherwise shown. Ballasts shall have maximum current crest factor of 1.7; high power factor; Class A sound rating; maximum operating case temperature of 77 degrees F above ambient; and shall be rated Class P. Unless otherwise indicated, the minimum number of ballasts shall be used to serve each individual fixture. A single ballast may be used to serve multiple fixtures if they are continuously mounted, identically controlled and factory manufactured for that installation with an integral wireway.

(1) Compact fluorescent ballasts shall comply with IEEE C62.41 Category A transient voltage variation requirements and shall be mounted integrally within compact fluorescent fixture housing unless otherwise shown. Ballasts shall have minimum ballast factor of 0.95; maximum current crest factor of 1.6; high power factor; maximum operating case temperature of 77 degrees F above ambient; shall be rated Class P; and shall have a sound rating of Class A. Ballasts shall meet FCC Class A specifications for EMI/RFI emissions. Ballasts shall operate from nominal line voltage of 120 volts at 60 Hz and maintain constant light output over a line voltage variation of $\pm 10\%$. Ballasts shall have an end-of-lamp-life detection and shut-down circuit. Ballasts shall be UL listed and shall contain no PCBs. Ballasts shall contain potting to secure PC board, provide lead strain relief, and provide a moisture barrier.

(2) Electronic fluorescent ballasts shall comply with 47 CFR 18 for electromagnetic interference. Ballasts shall withstand line transients per IEEE C62.41, Category A. Ballasts shall have total harmonic distortion between 10 and 20%; minimum frequency of 20,000Hz; filament voltage between 2.5 and 4.5 volts; maximum starting inrush current of 20 amperes.. Minimum starting temperature shall be 50 degrees F. Ballasts shall carry a manufacturer's full warranty of three years, including a minimum \$10 labor allowance per ballast.

(3) Magnetic fluorescent ballasts shall be energy-saving, automatic resetting type, approved for the application by the Certified Ballast Manufacturers and complying with ANSI C82.1 and UL 935. Minimum ballast starting temperature shall be 40 degrees F for normal service and 0 degrees F where cold temperature service is required.

2.10.3 Fixtures

Fixtures shall be in accordance with the size, shape, appearance, finish, and performance shown. Unless otherwise indicated, lighting fixtures shall be provided with housings, junction boxes, wiring, lampholders, mounting supports, trim, hardware and accessories for a complete and operable installation. Recessed housings shall be minimum 20 gauge cold rolled or galvanized steel as shown. Extruded aluminum fixtures shall have minimum wall thickness of 0.125 inches. Plastic lenses shall be 100% virgin acrylic or as shown. Glass lenses shall be tempered. Heat resistant glass shall be borosilicate type. Conoid recessed reflector cones shall be Alzak with clear specular low iridescent finish.

- a. Incandescent fixtures shall comply with UL 1571. Incandescent fixture specular reflector cone trims shall be integral to the cone and shall be finished to match. Painted trim finishes shall be white with minimum reflectance of 88%. Low voltage incandescent fixtures shall have integral step-down transformers.
- b. Fluorescent fixtures shall comply with UL 1570. Integral ballast and wireway compartments shall be easily accessible without the use of special tools. Housings shall be constructed to include grounding necessary to start the lamps. Open fixtures shall be equipped with a sleeve, wire guard, or other positive means to prevent lamps from falling. Medium bi-pin lampholders shall be twist-in type with positive locking position. Long compact fluorescent fixtures and fixtures utilizing U-bend lamps shall have clamps or secondary lampholders to support the free ends of the lamps.

2.10.4 Lampholders, Starters, and Starter Holders

UL 542

2.11 LOW-VOLTAGE FUSES AND FUSEHOLDERS

2.11.1 Fuses, Low Voltage Cartridge Type

NEMA FU 1.

2.11.2 Fuses, High-Interrupting-Capacity, Current-Limiting Type

Fuses, Class G, J, L and CC shall be in accordance with UL 198C.

2.11.3 Fuses, Class K, High-Interrupting-Capacity Type

UL 198D.

2.11.4 Fuses, Class H

UL 198B.

2.11.5 Fuses, Class R

UL 198E.

2.11.6 Fuses for Supplementary Overcurrent Protection

UL 198G.

2.11.7 Fuseholders

UL 512.

2.12 MOTORS, AC, FRACTIONAL AND INTEGRAL

Motors, ac, fractional and integral horsepower, 500 hp and smaller shall conform to NEMA MG 1 and UL 1004 for motors; NEMA MG 10 for energy management selection of polyphase motors.

2.12.1 Rating

The horsepower rating of motors should be limited to no more than 125 percent of the maximum load being served unless a NEMA standard size does not fall within this range. In this case, the next larger NEMA standard motor size should be used.

2.13 MOTOR CONTROLS

2.13.1 General

NEMA ICS 1, NEMA ICS 2, NEMA ICS 3 and NEMA ICS 6, and UL 508.

2.13.2 Motor Starters

Combination starters shall be provided with circuit breakers or fusible switches.

2.13.3 Thermal-Overload Protection

Each motor of 1/8 hp or larger shall be provided with thermal-overload protection. Polyphase motors shall have overload protection in each ungrounded conductor. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single or double pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating.

2.13.4 Low-Voltage Motor Overload Relays

2.13.4.1 General

Thermal or magnetic current overload relays shall conform to NEMA ICS 2 and UL 508. Overload protection shall be provided either integral with the motor or motor controller, and shall be rated in accordance with the requirements of NFPA 70.

2.13.4.2 Construction

Manual reset type thermal relay shall be melting alloy or bimetallic construction. Automatic reset type thermal relays shall be bimetallic construction. Magnetic current relays shall consist of a contact mechanism and a dash pot mounted on a common frame.

2.13.4.3 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. Trip current ratings shall be established by selection of the replaceable overload device and shall not be adjustable. Where the controller is remotely-located or difficult to reach, an automatic reset, non-compensated overload relay shall be provided. Manual reset overload relays shall be provided otherwise, and at all locations where automatic starting is provided. Where the motor is located in a constant ambient temperature, and the thermal device is located in an ambient temperature that regularly varies by more than minus 18 degrees F, an ambient temperature-compensated overload relay shall be provided.

2.13.5 Automatic Control Devices

2.13.5.1 Direct Control

Automatic control devices (such as thermostats, float or pressure switches) which control the starting and stopping of motors directly shall be designed for that purpose and have an adequate horsepower rating.

2.13.5.2 Pilot-Relay Control

Where the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit.

2.13.5.3 Manual/Automatic Selection

- a. Where combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch (marked MANUAL-OFF-AUTOMATIC) shall be provided for the manual control.
- b. Where combination manual and automatic control is specified and the automatic-control device actuates the pilot control circuit of a magnetic starter, the magnetic starter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC.
- c. Connections to the selector switch shall be such that; only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low-or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic

regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

2.14 PANELBOARDS

Dead-front construction, NEMA PB 1 and UL 67.

2.15 RECEPTACLES

2.15.1 Standard Grade

UL 498.

2.15.2 Ground Fault Interrupters

UL 943, Class A .

2.15.3 NEMA Standard Receptacle Configurations

NEMA WD 6.

a. Single and Duplex, 15-Ampere and 20-Ampere, 125 Volt

15-ampere, non-locking: NEMA type 5-15R, 20-ampere, non-locking: NEMA type 5-20R.

b. 30-Ampere, 125/250 Volt

Three-pole, 4-wire grounding, non-locking: NEMA type 14-30R.

c. 50-Ampere, 125/250 Volt

Three-pole, 4-wire grounding: NEMA type 14-50R.

2.16 Service Entrance Equipment

UL 869A.

2.17 SPLICE, CONDUCTOR

UL 486C.

2.18 SNAP SWITCHES

UL 20.

2.19 TAPES

2.19.1 Plastic Tape

UL 510.

2.19.2 Rubber Tape

UL 510.

2.20 WIRING DEVICES

NEMA WD 1 for wiring devices, and NEMA WD 6 for dimensional requirements of wiring devices.

PART 3 EXECUTION

3.1 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following specifications.

3.1.1 Ground Rods

The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 2 additional rods not less than 6 feet on centers, or if sectional type rods are used, 2 additional sections may be coupled and driven with the first rod. In high-ground-resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

3.1.2 Grounding Conductors

Equipment grounding bars shall be provided in all panelboards. The equipment grounding conductor shall be carried back to the service entrance grounding connection or separately derived grounding connection. All equipment grounding conductors, including metallic raceway systems used as such, shall be bonded or joined together in each wiring box or equipment enclosure. Metallic raceways and grounding conductors shall be checked to assure that they are wired or bonded into a common junction. Metallic boxes and enclosures, if used, shall also be bonded to these grounding conductors by an approved means per NFPA 70. When switches, or other utilization devices are installed, any designated grounding terminal on these devices shall also be bonded to the equipment grounding conductor junction with a short jumper.

3.2 WIRING METHODS

Wiring shall conform to NFPA 70, the contract drawings, and the following specifications. Unless otherwise indicated, wiring shall consist of nonmetallic-sheathed cables installed in areas permitted by NFPA 70. Where conduit is indicated or required by NFPA 70, wire fill in conduits shall be based on NFPA 70 for the type of conduit and wire insulations specified.

3.2.1 Conduit and Tubing Systems

Conduit and tubing systems shall be installed as indicated or as required by NFPA 70. Conduit sizes shown are based on use of copper conductors with insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 1/2 inch. Nonmetallic conduit and tubing may be used in damp, wet or corrosive locations when permitted by NFPA 70 and the

conduit or tubing system is provided with appropriate boxes, covers, clamps, screws or other appropriate type of fittings. Electrical metallic tubing (EMT) may be installed only within buildings. EMT may be installed in concrete and grout in dry locations. EMT installed in concrete or grout shall be provided with concrete tight fittings. EMT shall not be installed in damp or wet locations, or the air space of exterior masonry cavity walls. Bushings, manufactured fittings or boxes providing equivalent means of protection shall be installed on the ends of all conduits and shall be of the insulating type, where required by NFPA 70. Only UL listed adapters shall be used to connect EMT to rigid metal conduit, cast boxes, and conduit bodies. Penetrations of above grade floor slabs, time-rated partitions and fire walls shall be firestopped in accordance with Section 07840 FIRESTOPPING. Except as otherwise specified, IMC may be used as an option for rigid steel conduit in areas as permitted by NFPA 70. Raceways shall not be installed under the firepits of boilers and furnaces and shall be kept 6 inches away from parallel runs of flues, steam pipes and hot-water pipes. Raceways shall be concealed within finished walls, ceilings, and floors unless otherwise shown. Raceways crossing structural expansion joints or seismic joints shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding.

3.2.1.1 Pull Wires

A pull wire shall be inserted in each empty raceway in which wiring is to be installed if the raceway is more than 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 200 pounds per square inch tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

3.2.1.2 Below Slab-on-Grade or in the Ground

Electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

3.2.1.3 Installing in Slabs Including Slabs on Grade

Conduit installed in slabs-on-grade shall be rigid steel or IMC. Conduits shall be installed as close to the middle of concrete slabs as practicable without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as approved by the Contracting Officer. Where conduit is run parallel to reinforcing steel, the conduit shall be spaced a minimum of one conduit diameter away but not less than one inch from the reinforcing steel.

3.2.1.4 Changes in Direction of Runs

Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be

avoided where possible. Lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment shall be prevented during the course of construction. Clogged raceways shall be cleared of obstructions or shall be replaced.

3.2.1.5 Supports

Metallic conduits and tubing, and the support system to which they are attached, shall be securely and rigidly fastened in place to prevent vertical and horizontal movement at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, beam clamps, or ceiling trapeze. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structure. Loads shall not be applied to joist bridging. Attachment shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Cutting the main reinforcing bars in reinforced concrete beams or joists shall be avoided when drilling holes for support anchors. Holes drilled for support anchors, but not used, shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Raceways shall not be supported using wire or nylon ties. Raceways shall be independently supported from the structure. Upper raceways shall not be used as a means of support for lower raceways. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Cables and raceways shall not be supported by ceiling grids. Except where permitted by NFPA 70, wiring shall not be supported by ceiling support systems. Conduits shall be fastened to sheet-metal boxes and cabinets with two locknuts where required by NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. Additional support for horizontal runs is not required when EMT rests on steel stud cutouts.

3.2.1.6 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Raceways under raised floors and above accessible ceilings shall be considered as exposed installations in accordance with NFPA 70 definitions.

3.2.1.7 Communications Raceways

Communications raceways indicated shall be installed in accordance with the previous requirements for conduit and tubing and with the additional requirement that no length of run shall exceed 50 feet for 3/4 inch sizes, and 100 feet for 1 inch or larger sizes, and shall not contain more than two 90-degree bends or the equivalent. Additional pull or junction boxes shall be installed to comply with these limitations whether or not indicated. Inside radii of bends in conduits of 1 inch size or larger shall not be less than ten times the nominal diameter.

3.2.2 Cables and Conductors

Installation shall conform to the requirements of NFPA 70. Covered, bare or insulated conductors of circuits rated over 600 volts shall not occupy the same equipment wiring enclosure, cable, or raceway with conductors of circuits rated 600 volts or less.

3.2.2.1 Sizing

Unless otherwise noted, all sizes are based on copper conductors and the insulation types indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100 feet long from panel to load center, shall be no smaller than No. 10 AWG. Class 1 remote control and signal circuit conductors shall be not less than No. 14 AWG. Class 2 remote control and signal circuit conductors shall be not less than No. 16 AWG. Class 3 low-energy, remote-control and signal circuits shall be not less than No. 22 AWG.

3.2.2.2 Cable Systems

Cable systems shall be installed where indicated. Cables shall be installed concealed behind ceiling or wall finish where practicable. Cables shall be threaded through holes bored on the approximate centerline of wood members; notching of surfaces will not be permitted. Sleeves shall be provided through bond beams of masonry-block walls for threading cables through hollow spaces.

3.2.2.3 Cable Splicing

Splices shall be made in an accessible location. Crimping tools and dies shall be approved by the connector manufacturer for use with the type of connector and conductor.

- a. Copper Conductors, 600 Volt and Under: Splices in conductors No. 10 AWG and smaller diameter shall be made with an insulated, pressure-type connector. Splices in conductors No. 8 AWG and larger diameter shall be made with a solderless connector and insulated with tape or heat-shrink type insulating material equivalent to the conductor insulation.

3.2.2.4 Conductor Identification and Tagging

Power, control, and signal circuit conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation. Phase conductors of low voltage power circuits shall be identified by color coding. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

- a. Color coding shall be provided for service, feeder, branch, and ground conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in the same raceway or box, other neutral shall be white with colored (not green) stripe. The color coding for 3-phase and single-phase low voltage systems shall be as follows:

120/208-volt, 3-phase: Black(A), red(B), and blue(C).

120/240-volt, 1-phase: Black and red.

- b. Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by color-coded insulation, or conductors with black insulation may be furnished and identified by the use of half-lapped bands of colored electrical tape wrapped around the insulation for a minimum of 3 inches of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer.
- c. Control and signal circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved detail drawings. Hand lettering or marking is not acceptable.

3.3 BOXES AND SUPPORTS

Boxes shall be provided in the wiring or raceway systems where required by NFPA 70 for pulling of wires, making connections, and mounting of devices or fixtures. Pull boxes shall be furnished with screw-fastened covers. Indicated elevations are approximate. Unless otherwise indicated, boxes for wall switches shall be mounted 48 inches above finished floors. Switch and outlet boxes located on opposite sides of fire rated walls shall be separated by a minimum horizontal distance of 24 inches. The total combined area of all box openings in fire rated walls shall not exceed 100 square inches per 100 square feet. Maximum box areas for individual boxes in fire rated walls vary with the manufacturer and shall not exceed the maximum specified for that box in UL Elec Const Dir. Only boxes listed in UL Elec Const Dir shall be used in fire rated walls.

3.3.1 Box Applications

Each box shall have not less than the volume required by NFPA 70 for number of conductors enclosed in box. Boxes for metallic raceways shall be listed for the intended use when located in normally wet locations, when flush or surface mounted on outside of exterior surfaces, or when located in hazardous areas. Boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes for mounting lighting fixtures shall be not less than 4 inches square, or octagonal, except smaller boxes may be installed as required by fixture configuration, as approved. Cast-metal boxes with 3/32 inch wall thickness are acceptable. Large size boxes shall be as shown. Boxes in other locations shall be sheet steel except that nonmetallic boxes may be used with nonmetallic conduit or nonmetallic sheathed cable system, when permitted by NFPA 70. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.

3.3.2 Brackets and Fasteners

Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on

concrete or brick, with toggle bolts on hollow masonry units, and with machine screw or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. Penetration of more than 1-1/2 inches into reinforced-concrete beams or more than 3/4 inch into reinforced-concrete joists shall avoid cutting any main reinforcing steel. The use of brackets which depend on gypsum wallboard or plasterboard for primary support will not be permitted. In partitions of light steel construction, bar hangers with 1 inch long studs, mounted between metal wall studs or metal box mounting brackets shall be used to secure boxes to the building structure. When metal box mounting brackets are used, additional box support shall be provided on the side of the box opposite the brackets. This additional box support shall consist of a minimum 12 inch long section of wall stud, bracketed to the opposite side of the box and secured by two screws through the wallboard on each side of the stud. Metal screws may be used in lieu of the metal box mounting brackets.

3.3.3 Mounting in Walls, Ceilings, or Recessed Locations

In walls or ceilings of concrete, tile, or other non-combustible material, boxes shall be installed so that the edge of the box is not recessed more than 1/4 inch from the finished surface. Boxes mounted in combustible walls or ceiling material shall be mounted flush with the finished surface. The use of gypsum or plasterboard as a means of supporting boxes will not be permitted. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. The bottom of boxes installed in masonry-block walls for concealed wiring shall be mounted flush with the top of a block to minimize cutting of the blocks, and boxes shall be located horizontally to avoid cutting webs of block. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture terminal operating temperature, and fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided.

3.4 DEVICE PLATES

One-piece type device plates shall be provided for all outlets and fittings. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast-metal, or impact resistant plastic having rounded or beveled edges. Plates on finished walls shall be of impact-resistant plastic and shall be white in color unless otherwise indicated. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

3.5 RECEPTACLES

3.5.1 Single and Duplex, 15 or 20-ampere, 125 volt

Single and duplex receptacles shall be rated 15 or 20 amperes as indicated, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be white in color unless otherwise indicated, and supported by mounting strap having plaster ears. Contact arrangement shall

be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke. Switched receptacles shall be the same as other receptacles specified except that the ungrounded pole of each suitable receptacle shall be provided with a separate terminal. Only the top receptacle of a duplex receptacle shall be wired for switching application. Receptacles with ground fault circuit interrupters shall have the current rating as indicated, and shall be UL Class A type unless otherwise shown. Ground fault circuit protection shall be provided as required by NFPA 70 and as indicated on the drawings.

3.5.2 Weatherproof Applications

Weatherproof receptacles shall be suitable for the environment, damp or wet as applicable, and the housings shall be labeled to identify the allowable use. Receptacles shall be marked in accordance with UL 514A for the type of use indicated; "Damp locations", "Wet Locations", "Wet Location Only When Cover Closed". Assemblies shall be installed in accordance with the manufacturer's recommendations.

3.5.2.1 Damp Locations

Receptacles in damp locations shall be mounted in an outlet box with a gasketed, weatherproof, cast-metal cover plate (device plate, box cover) and a gasketed cap (hood, receptacle cover) over each receptacle opening. The cap shall be either a screw-on type permanently attached to the cover plate by a short length of bead chain or shall be a flap type attached to the cover with a spring loaded hinge.

3.5.2.2 Wet Locations

Receptacles in wet locations shall be installed in an assembly rated for such use whether the plug is inserted or withdrawn, unless otherwise indicated. In a duplex installation, the receptacle cover shall be configured to shield the connections whether one or both receptacles are in use.

3.5.3 Receptacles, 30-Ampere, 125/250-Volt

Receptacles, single, 30-ampere, 125/250-volt, shall be molded-plastic, three-pole, four-wire, grounding type, complete with appropriate mating cord-grip type attachment plug. Each dryer receptacle shall be furnished with a non-detachable power supply cord for connection to the electric clothes dryer. The cord shall be an angle-type 36 inch length of Type SRD range and dryer cable with four No. 10 AWG conductors.

3.5.4 Receptacles, 50-Ampere, 125/250-Volt

Receptacles, single 50-ampere, 125/250-volt, shall be flush, molded plastic, three-pole, four-wire, grounding type. Each range receptacle shall be furnished with a nondetachable power supply cord for connection to the electric range. The cord shall be an angle-type 36 inch length of SRD range and dryer cable with two No. 8 and two No. 6 AWG conductors.

3.5.5 Special-Purpose or Heavy-Duty Receptacles

Special-purpose or heavy-duty receptacles shall be of the type and of ratings and number of poles indicated or required for the anticipated purpose. Contact surfaces may be either round or rectangular. One

appropriate straight or angle-type plug shall be furnished with each receptacle. Locking type receptacles, rated 30 amperes or less, shall be locked by rotating the plug. Locking type receptacles, rated more than 50 amperes, shall utilize a locking ring.

3.6 WALL SWITCHES

Wall switches shall be of the totally enclosed tumbler type. The wall switch handle and switch plate color shall be white unless otherwise indicated. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than one switch shall be installed in a single-gang position. Switches shall be rated 15 or 20-ampere as indicated, 120-volt for use on alternating current only. Pilot lights indicated shall consist of yoke-mounted candelabra-base sockets rated at 75 watts, 125 volts, and fitted with glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be green, and jewels for other purposes shall be red. Dimming switches shall be solid-state flush mounted, sized for the loads.

3.7 SERVICE EQUIPMENT

Service-disconnecting means shall be of the type indicated. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.8 PANELBOARDS AND LOADCENTERS

Circuit breakers and switches used as a motor disconnecting means shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering. Support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Bus bars shall be copper or aluminum, and shall be tin plated or silver plated. Provide isolated neutral bus where indicated in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

3.8.1 Loadcenters

Single-phase panelboards for housing units on this project shall be load center type, circuit breaker equipped, conforming to UL 67 and UL 50. Panelboards shall have a short-circuit current rating as indicated for the main breaker and the branch breakers. Panelboards for use as service disconnecting means shall additionally conform to UL 869A. Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings. Where "space only" is indicated, make provisions for future installation of breakers. Provide cover with latching door. Directories shall indicate load served by each circuit in panelboard. Directories shall also indicate source of service to panelboard (e.g., Panel PA served from panel MDP). Type directories and

mount behind transparent protective covering on inside of panel door in a manner approved by the Contracting Officer. Support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Bus bars shall be copper or aluminum, and shall be tin plated or silver plated. Provide isolated neutral bus where indicated in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

3.8.2 Panelboards

Panelboards shall be circuit breaker equipped as indicated on the drawings.

3.9 FUSES

Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilize fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

3.9.1 Cartridge Fuses; Noncurrent-Limiting Type

Cartridge fuses of the noncurrent-limiting type shall be Class H, nonrenewable, dual element, time lag type and shall have interrupting capacity of 10,000 amperes. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds.

3.9.2 Cartridge Fuses; Current-Limiting Type

Cartridge fuses, current-limiting type, Class RK5 shall have tested interrupting capacity not less than 100,000 amperes. Fuse holders shall be the type that will reject all Class H fuses.

3.9.3 Motor and Transformer Circuit Fuses

Motor, motor controller, transformer, and inductive circuit fuses shall be Class RK5, current-limiting, time-delay with 100,000 amperes interrupting capacity.

3.10 UNDERGROUND SERVICE

Unless otherwise indicated, interior conduit systems shall be stubbed out 5 feet beyond the building wall and 2 feet below finished grade, for interface with the exterior service lateral conductors. Outside conduit ends shall be bushed when used for direct burial service lateral conductors. Outside conduit ends shall be capped or plugged until connected to exterior conduit systems. Underground service lateral conductors will be extended to building service entrance and terminated in accordance with the requirements of NFPA 70.

3.11 MOTORS

Each motor shall conform to the hp and voltage ratings indicated, and shall have a service factor and other characteristics that are essential to the proper application and performance of the motors under conditions shown or specified. Three-phase motors for use on 3-phase 208-volt systems shall have a nameplate rating of 200 volts. Unless otherwise specified, all motors shall have open frames, and continuous-duty classification based on a 40 degree C ambient temperature reference. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are specified in other sections of these specifications or shown on contract drawings. The Contractor shall be responsible for selecting the actual horsepower ratings and other motor requirements necessary for the applications indicated. When electrically driven equipment furnished under other sections of these specifications materially differs from the design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices and branch-circuit protection to accommodate the equipment actually installed.

3.12 MOTOR CONTROL

Each motor or group of motors requiring a single control shall be provided under other sections of these specifications with a suitable controller and devices that will perform the functions as specified for the respective motors. Each motor of 1/8 hp or larger shall be provided with thermal-overload protection. Polyphase motors shall have overload protection in each ungrounded conductor. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single or double pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating. Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motors directly, provided the devices used are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit. When combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC. Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low- or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

3.12.1 Contacts

Unless otherwise indicated, contacts in miscellaneous control devices such as float switches, pressure switches, and auxiliary relays shall have current and voltage ratings in accordance with NEMA ICS 2 for rating

designation B300.

3.12.2 Safety Controls

Safety controls for boilers shall be connected to a 2-wire, 120 volt grounded circuit supplied from the associated boiler-equipment circuit. Where the boiler circuit is more than 120 volts to ground, safety controls shall be energized through a two-winding transformer having its 120 volt secondary winding grounded. Overcurrent protection shall be provided in the ungrounded secondary conductor and shall be sized for the load encountered.

3.13 MOTOR-DISCONNECT MEANS

Each motor shall be provided with a disconnecting means when required by NFPA 70 even though not indicated. For single-phase motors, a single or double pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Switches shall disconnect all ungrounded conductors.

3.14 LIGHTING FIXTURES, LAMPS AND BALLASTS

This paragraph shall cover the installation of lamps, lighting fixtures and ballasts in interior or building mounted applications.

3.14.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion. Lamps installed and used for working light during construction shall be replaced prior to turnover to the Government if more than 15% of their rated life has been used. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer. 10% spare lamps of each type, from the original manufacturer, shall be provided.

3.14.2 Lighting Fixtures

Fixtures shall be as shown and shall conform to the following specifications and shall be as detailed on the drawings. Illustrations shown on the drawings are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved.

3.14.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

3.14.2.2 Ceiling Fixtures

Ceiling fixtures shall be coordinated with and suitable for installation in, on or from the ceiling as shown. Installation and support of fixtures shall be in accordance with NFPA 70 and manufacturer's recommendations. Recessed fixtures shall have adjustable fittings to permit alignment with ceiling panels. Recessed fixtures installed in fire-resistive ceiling

construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling, in conformance with UL Elec Const Dir. Surface-mounted fixtures shall be suitable for fastening to the ceiling panel structural supports.

3.15 EQUIPMENT CONNECTIONS

Wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph WIRING METHODS. Flexible conduits 6 feet or less in length shall be provided to all electrical equipment subject to periodic removal, vibration, or movement and for all motors. All motors shall be provided with separate grounding conductors. Liquid-tight conduits shall be used in damp or wet locations.

3.15.1 Motors and Motor Control

Motors, motor controls shall be installed in accordance with NFPA 70, the manufacturer's recommendations, and as indicated. Wiring shall be extended to motors, motor controls, and terminated.

3.15.2 Installation of Government-Furnished Equipment

Wiring shall be extended to the equipment and terminated.

3.15.3 Food Service Equipment Provided Under Other Sections

Wiring shall be extended to the equipment and terminated.

3.16 CIRCUIT PROTECTIVE DEVICES

The Contractor shall calibrate, adjust, set and test each new adjustable circuit protective device to ensure that they will function properly prior to the initial energization of the new power system under actual operating conditions.

3.17 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900 PAINTING, GENERAL.

3.18 REPAIR OF EXISTING WORK

The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceiling, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to building, piping, or equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Government.

3.19 FIELD TESTING

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 14 days prior to conducting tests. The Contractor shall furnish all materials, labor,

and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspection recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. All field test reports will be signed and dated by the Contractor.

3.19.1 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.19.2 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Soil resistivity in the area of the grid shall be measured concurrently with the grid measurements. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Single rod electrode - 25 ohms.
- b. Grid electrode - 25 ohms.

3.19.3 Ground-Grid Connection Inspection

All below-grade ground-grid connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 24 hours before the site is ready for inspection.

3.20 OPERATING TESTS

After the installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the specified requirements. An operating test report shall be submitted in accordance with paragraph FIELD TEST REPORTS.

3.21 FIELD SERVICE

3.21.1 Onsite Training

The Contractor shall conduct training for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The course instruction shall cover pertinent points involved in operating, starting, stopping, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations.

3.22 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

-- End of Section --

SECTION 16710A

PREMISES DISTRIBUTION SYSTEM

04/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

ANSI/TIA/EIA-568-A	(1995) Commercial Building Telecommunications Cabling Standard
ANSI/TIA/EIA-568-A-5	(2000) Transmission Performance Specifications for 4-pair 100 ohm Category 5E Cabling
ANSI/TIA/EIA-606	(1993) Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
ANSI/TIA/EIA-607	(1994) Commercial Building Grounding and Bonding Requirements for Telecommunications
TIA/EIA TSB 67	(1995) Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-80-576	(1994) Communications Wire and Cable for Wiring of Premises
ICEA S-83-596	(1994) Fiber Optic Premises Distribution Cable

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code
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UNDERWRITERS LABORATORY (UL)

UL 50	(1995; Rev thru Nov 1999) Enclosures for Electrical Equipment
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1.2 SYSTEM DESCRIPTION

The premises distribution system shall consist of inside-plant horizontal, riser, and backbone cables and connecting hardware to transport telephone and data (including LAN) signals between equipment items in a building.

1.3 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, noncondensing.

1.4 QUALIFICATIONS

1.4.1 Minimum Contractor Qualifications

All work under this section shall be performed by and all equipment shall be furnished and installed by a certified Telecommunications Contractor, hereafter referred to as the Contractor. The Contractor shall have the following qualifications in Telecommunications Systems installation:

- a. Contractor shall have a minimum of 3 years experience in the application, installation and testing of the specified systems and equipment.
- b. All supervisors and installers assigned to the installation of this system or any of its components shall have factory certification from each equipment manufacturer that they are qualified to install and test the provided products. General electrical trade staff (electricians) shall not be used for the installation of premises distribution system cables and associated hardware.
- c. All installers assigned to the installation of this system or any of its components shall have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components.

1.4.2 Minimum Manufacturer Qualifications

The equipment and hardware provided under this contract will be from manufacturers that have a minimum of 3 years experience in producing the types of systems and equipment specified.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Premises Distribution System; G.

Provide detail drawings including a complete list of equipment and material. Provide registered communications distribution designer (RCDD) approved drawings complete with wiring diagrams and details required to prove that the distribution system shall properly support connectivity from the telecommunications equipment to telecommunications work area outlets. Show the entrance facility and layout of cabling and pathway runs, cross connect points, grounding system, terminating block arrangements and type. Drawings shall depict final telecommunications cabling configuration, including location, color coding, gage, pair

assignment, polarization, and terminating blocks layout at cross connect points and patch panels after telecommunications cable installation in accordance with TIA/EIA -606.

Record Drawings; G.

Communication drawings shall be provided for complete distribution system layout separate from any power or other signal systems. Approved drawings and details shall be submitted in disk copy, AutoCAD version 14 or later in addition to paper copy. Material list shall be submitted in paper copy and disk copy, Microsoft Word, latest version. Additionally, provide a plastic laminated schematic of telecommunications cable system showing cabling and equipment keyed to floor plans. Record drawings for the installed wiring system infrastructure per ANSI/TIA/EIA-606. The drawings shall show the location of all cable terminations and location and routing of all backbone and horizontal cables. The identifier for each termination and cable shall appear on the drawings.

SD-03 Product Data

Record Keeping and Documentation; G.

Documentation on cables and termination hardware in accordance with ANSI/TIA/EIA-606.

Spare Parts; G.

Lists of spare parts, tools, and test equipment for each different item of material and equipment specified, after approval of detail drawings, not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking.

Manufacturer's Recommendations; G.

Where installation procedures, or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations, prior to installation shall be provided. Installation of the item will not be allowed to proceed until the recommendations are received and approved.

Test Plan; G.

Test plan defining the tests required to ensure that the system meets technical, operational and performance specifications, 30 days prior to the proposed test date. The test plan must be approved before the start of any testing. The test plan shall identify the capabilities and functions to be tested, and include detailed instructions for the setup and execution of each test and procedures for evaluation and documentation of the results.

Qualifications; G.

The qualifications of the Manufacturer, Contractor, and the Installer to perform the work specified herein. This shall include

proof of the minimum qualifications specified herein.

SD-06 Test Reports

Test Reports; G.

Test reports in booklet form with witness signatures verifying execution of tests. Test results will also be provided on 3-1/2 inch diskettes and in hard copy format. Reports shall show the field tests performed to verify compliance with the specified performance criteria. Test reports shall include record of the physical parameters verified during testing. Test reports shall be submitted within 7 days after completion of testing.

SD-07 Certificates

Premises Distribution System; G.

Written certification that the premises distribution system complies with the ANSI/TIA/EIA-568-A, ANSI/TIA/EIA-570, and ANSI/TIA/EIA-606 standards.

Materials and Equipment; G.

Where materials or equipment are specified to conform, be constructed or tested to meet specific requirements, certification that the items provided conform to such requirements. Certification by a nationally recognized testing laboratory that a representative sample has been tested to meet the requirements, or a published catalog specification statement to the effect that the item meets the referenced standard, will be acceptable as evidence that the item conforms. Compliance with these requirements does not relieve the Contractor from compliance with other requirements of the specifications.

Installers; G.

The Contractor shall submit certification that all the installers are factory certified to install and test the provided products.

1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust or other contaminants.

1.7 OPERATION AND MAINTENANCE MANUALS

Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of the premises distribution system. Specification sheets for all cable, connectors, and other equipment shall be provided.

1.8 RECORD KEEPING AND DOCUMENTATION

1.8.1 Cables

A record of all installed cable shall be provided in hard copy format per ANSI/TIA/EIA-606. The cable records shall include the required data fields

for each cable and complete end-to-end circuit report for each complete circuit from the assigned outlet to the entry facility per ANSI/TIA/EIA-606. All twisted pair copper cables shall have hard copy and disk copy outputs of the test results with station ID assigned.

1.8.2 Termination Hardware

A record of all installed patch panels and outlets shall be provided in hard copy and disk copy format per ANSI/TIA/EIA-606. The hardware records shall include only the required data fields per ANSI/TIA/EIA-606.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall be the manufacturer's latest standard design that has been in satisfactory use for at least 1 year prior to installation. Materials and equipment shall conform to the respective publications and other requirements specified below and to the applicable requirements of NFPA 70.

2.2 UNSHIELDED TWISTED PAIR CABLE SYSTEM

2.2.1 Building protector Assemblies

Terminate outside plant cables on network interface device with protection modules.

2.2.2 Protector Modules

Protection modules shall comply with UL 497 and REA TECM 823. Number of surge protection modules shall equal the number of pairs of exterior cable entering the building.

2.2.3 Backbone Cable

Backbone cable shall meet the requirements of ICEA S-80-576 and ANSI/TIA/EIA-568-A for Category 3 100-ohm unshielded twisted pair cable. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Conductors shall be solid untinned copper 24 AWG. Cable shall be rated CMP per NFPA 70.

2.2.4 Horizontal Cable

Horizontal cable shall meet the requirements of ANSI/TIA/EIA-568-A-5 for Category 5e. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Cable shall be rated CMP per NFPA 70.

2.2.5 Connecting Hardware

Connecting and cross-connecting hardware shall be the same category as the cable it serves. Hardware shall be in accordance with ANSI/TIA/EIA-568-A.

2.2.5.1 Telecommunications Outlets

Wall outlet plates shall come equipped as indicated and be labeled in accordance with the Langley AFB standard labeling scheme. Modular jacks shall be the same category as the cable they terminate and shall meet the requirements of ANSI/TIA/EIA-568-A. Modular jack pin/pair configuration shall be T568A per ANSI/TIA/EIA-568-A. Modular jacks shall be unkeyed. Faceplates shall be provided and shall be white in color unless otherwise indicated and impact resistant plastic. Outlet assemblies used in the premises distribution system shall consist of modular jacks assembled into both quadraplex and duplex outlet assemblies in single or double gang covers as indicated on the drawings. The modular jacks shall conform to the requirements of ANSI/TIA/EIA-568-A, and shall be rated for use with Category 5e cable in accordance with ANSI/TIA/EIA-568-A-5 and shall meet the Link Test parameters as listed in TIA/EIA TSB 67 and supplemented by ANSI/TIA/EIA-568-A-5.

2.2.5.2 Patch Panels

Patch panels shall consist of eight-position modular jacks, with rear mounted type 110 insulation displacement connectors, arranged in rows or columns on 19 inch rack mounted wall cabinet. Jack pin/pair configuration shall be T568A per ANSI/TIA/EIA-568-A. Jacks shall be unkeyed. Panels shall be labelled in accordance with the Langley AFB standard labelling scheme. The modular jacks shall conform to the requirements of ANSI/TIA/EIA-568-A, and shall be rated for use with Category 5e cable in accordance with ANSI/TIA/EIA-568-A-5 and shall meet the Link Test parameters as listed in TIA/EIA TSB 67 and supplemented by ANSI/TIA/EIA-568-A-5.

2.2.5.3 Patch Cords

Patch cords shall be cable assemblies consisting of flexible, twisted pair stranded wire with eight-position plugs at each end. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Patch cords shall be wired straight through; pin numbers shall be identical at each end and shall be paired to match T568A patch panel jack wiring per ANSI/TIA/EIA-568-A. Patch cords shall be unkeyed. Patch cords shall be factory assembled. Patch cords shall conform to the requirements of ANSI/TIA/EIA-568-A-5 for Category 5e.

2.2.5.4 Terminal Blocks

Terminal blocks shall be backboard mounted or wall rack mounted wire termination units as indicated consisting of insulation displacement connectors mounted in plastic blocks, frames or housings. Blocks shall be type 110 which meet the requirements of ANSI/TIA/EIA-568-A, and shall be rated for use with Category 5e cable in accordance with ANSI/TIA/EIA-568-A-5 and shall meet the Link Test parameters as listed in TIA/EIA TSB 67 and supplemented by ANSI/TIA/EIA-568-A-5. Blocks shall include cable management hardware. Backboard mounted blocks shall include standoffs. Insulation displacement connectors shall terminate 22 or 24 gauge solid copper wire as a minimum, and shall be connected in pairs so that horizontal cable and connected jumper wires are on separate connected terminals.

2.2.6 Network Interface Device

Network Interface Device (NID) shall be UL listed and housed in a lockable flame retardant, impact resistant thermoplastic weatherproof enclosure.

Hardware shall be corrosion resistant brass or stainless steel. NID shall be modular in design with universal mounting provisions capable of accommodating 1-6 lines with termination facilities and station protectors.

Each line shall be equipped with industry standard RJ-11 and plug. Station protector for each line shall be hybrid 3-element gas tube with back-up air gap 356 studded. Protector DC breakdown voltage shall be 300-500Vdc, DC holdover 180Vdc@200mA and maximum single impulse discharge current 40kA 8/20 waveform (20kA per side simultaneously).

2.3 FIBER OPTIC CABLE SYSTEM

2.3.1 Backbone Cable

2.3.1.1 Multimode

Multimode fiber optic backbone cable shall meet the requirements of ANSI/TIA/EIA-568-A and ICEA S-83-596 for 62.5/125 micrometer multimode graded index optical fiber cable. Numerical aperture for each fiber shall be a minimum of 0.275. Cable construction shall be tight buffered type. Individual fibers shall be color coded for identification. Cable shall be imprinted with fiber count and aggregate length at regular intervals. Cable shall be rated OFNR per NFPA 70.

2.3.1.2 Singlemode

Singlemode fiber optic backbone cable shall meet the requirements of ICEA S-83-596 and the following: operation at a center wavelength of 1310 and 1550 nm; core/cladding diameter 8.3 nominal/125 micrometer; maximum attenuation 2.0 dB/km at 1300 nm, 1.75 dB/km at 1550 nm. Numerical aperture for each fiber shall be a minimum of 0.10. Cable construction shall be tight buffered type. Cable shall be imprinted with fiber count and aggregate length at regular intervals. Individual fibers shall be color coded for identification. Cable shall be rated OFNR per NFPA 70.

2.3.2 Connecting Hardware

2.3.2.1 Connectors

Connectors shall be SC or St type to coordinate with installed equipment with ceramic ferrule material with a maximum insertion loss of .5 dB. Connectors shall meet performance requirements of ANSI/TIA/EIA-568-A. Connectors shall be field installable. Connectors shall utilize adhesive for fiber attachment to ferrule. Connectors shall terminate fiber sizes as required for the service.

2.3.2.2 Patch Cords

Patch cords shall be cable assemblies consisting of flexible optical fiber cable with connectors of the same type as used elsewhere in the system. Optical fiber shall be the same type as used elsewhere in the system. Patch cords shall be complete assemblies from manufacturer's standard product lines.

2.4 EQUIPMENT RACKS

2.4.1 Wall Mounted Cabinets

Wall mounted cabinets shall conform to UL 50 and shall be constructed as indicated.

2.5 EQUIPMENT MOUNTING BACKBOARD

Plywood backboards shall be provided, sized as shown, painted with white or light colored paint.

2.6 TELECOMMUNICATIONS OUTLET BOXES

Electrical boxes for telecommunication outlets shall be 4-11/16 inch square by 2-1/8 inches deep with minimum 3/8 inch deep single or two gang plaster ring as shown. Provide conduit entries for conduits as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

System components and appurtenances shall be installed in accordance with NFPA 70, manufacturer's instructions and as shown. Necessary interconnections, services, and adjustments required for a complete and operable signal distribution system shall be provided. Components shall be labeled in accordance with ANSI/TIA/EIA-606. Penetrations in fire-rated construction shall be firestopped in accordance with Section 07840 FIRESTOPPING. Conduits, outlets and raceways shall be installed in accordance with Section 16415 ELECTRICAL WORK, INTERIOR and ANSI/TIA/EIA-569.

Wiring shall be installed in accordance with ANSI/TIA/EIA-568-A and as specified in Section 16415 ELECTRICAL WORK, INTERIOR. Wiring, and terminal blocks and outlets shall be marked in accordance with ANSI/TIA/EIA-606. Cables shall not be installed in the same raceway with ac power cables. Cables not installed in conduit or wireways shall be properly secured and neat in appearance and, if installed in plenums or other spaces used for environmental air, shall comply with NFPA 70 requirements for this type of installation.

3.1.1 Horizontal Distribution Cable

The rated cable pulling tension shall not be exceeded. Cable shall not be stressed such that twisting, stretching or kinking occurs. Cable shall not be spliced. Placement of cable parallel to power conductors shall be avoided, if possible; a minimum separation of 12 inches shall be maintained when such placement cannot be avoided. Cables shall be terminated; no cable shall contain unterminated elements. Minimum bending radius shall not be exceeded during installation or once installed. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.

3.1.2 Riser and Backbone Cable

Vertical cable support intervals shall be in accordance with manufacturer's recommendations. Cable bend radius shall not be less than ten times the outside diameter of the cable during installation and once installed. Maximum tensile strength rating of the cable shall not be exceeded. Cable shall not be spliced.

3.1.3 Telecommunications Outlets

3.1.3.1 Faceplates

As a minimum each jack shall be labeled as to its function and a unique number to identify cable link in accordance with the Langley labelling

scheme.

3.1.3.2 Cables

Unshielded twisted pair cables shall have a minimum of 8 inches of slack cable loosely coiled into the telecommunications outlet boxes and 5 feet of slack cable at the patch panel for modification or retermination. Minimum manufacturers bend radius for each type of cable shall not be exceeded.

3.1.3.3 Pull Cords

Pull cords shall be installed in all conduit serving telecommunications outlets which do not initially have cable installed.

3.1.4 Terminal Blocks

Terminal blocks shall be mounted in orderly rows and columns. Adequate vertical and horizontal wire routing areas shall be provided between groups of blocks. Industry standard wire routing guides shall be utilized.

3.1.5 Unshielded Twisted Pair Patch Panels

Patch panels shall be mounted in equipment racks with sufficient modular jacks to accommodate the installed cable plant plus 10 percent spares. Cable guides shall be provided above, below and between each panel.

3.1.6 Equipment Racks

Wall mounted racks shall be secured to the mounting surface to prevent fully loaded racks from separating from the mounting surface.

3.1.7 Rack Mounted Equipment

Equipment to be rack mounted shall be securely fastened to racks by means of the manufacturer's recommended fasteners.

3.2 TERMINATION

Cables and conductors shall sweep into termination areas; cables and conductors shall not bend at right angles. Manufacturer's minimum bending radius shall not be exceeded. When there are multiple system type drops to individual workstations, relative position for each system shall be maintained on each system termination block or patch panel. The maximum pulling tension for 4 pair 24 AWG horizontal UTP cables shall not exceed 25 lbf to avoid stretching the conductors during installation. Cable management precautions shall be observed to include the elimination of cable stress as caused by tension in suspended cable runs and tightly cinched cable bundles. Cable jackets shall be striped back only as far as require to connect to terminating hardware to reduce untwisting of pairs. In spaces with UTP terminations, cable bend radii shall be not less than 4 times the cable diameter for horizontal cable and shall be not less than 10 times the cable diameter for multi-pair cable. Care shall be exercised to minimize the twisting of cable during installation. The amount of untwisting in a pair as a result of termination to connecting hardware shall not exceed 0.5 inches for category 5e cable.

3.2.1 Unshielded Twisted Pair Cable

Each pair shall be terminated on appropriate outlets, terminal blocks or

patch panels. No cable shall be unterminated or contain unterminated elements. Pairs shall remain twisted together to within the proper distance from the termination as specified in ANSI/TIA/EIA-568-A. Conductors shall not be damaged when removing insulation. Wire insulation shall not be damaged when removing outer jacket.

3.2.2 Fiber Optic Cable

Each fiber shall have connectors installed. The pull strength between the connector and the attached fiber shall be not less than 25 pounds. The mated pair loss, without rotational optimization, shall not exceed 1.0 dB. Fiber optic connectors shall be installed per ANSI/TIA/EIA-568-A.

3.3 GROUNDING

Signal distribution system ground shall be installed at the telecommunications entrance facility in accordance with ANSI/TIA/EIA-607 and Section 16415 ELECTRICAL WORK, INTERIOR. Equipment racks and cabinets shall be connected to the electrical safety ground.

3.4 ADDITIONAL MATERIALS

The Contractor shall provide the following additional materials required for facility startup.

- a. 10 of each type outlet.
- b. 10 of each type cover plate.
- c. 1 of each type terminal block for each telecommunications closet.
- d. 4 Patch cords of 6feet for each SOQ dwelling unit.
- e. 1 Set of any and all special tools required to establish a cross connect and to change and/or maintain a terminal block.

3.5 ADMINISTRATION AND LABELING

3.5.1 Labeling

3.5.1.1 Labels

All labels shall be in accordance with ANSI/TIA/EIA-606 and the Langley AFB labeling standard.

3.6 INSPECTION AND TESTING

Materials and documentation to be furnished under this specification are subject to inspections and tests. All components shall be terminated prior to testing. Equipment and systems will not be accepted until the required inspections and tests have been made, demonstrating that the signal distribution system conforms to the specified requirements, and that the required equipment, systems, and documentation have been provided. System inspection will be provided through performance of pre-installation, in-progress, and final inspections by the Contracting Officer and Representative(s) of the Air Force at intervals provided by the Contracting Officer. The Contractor shall participate in and witness such inspections.

All items will be verified for compliance with the requirements of this specification, drawings and referenced publications. Inspections shall

include visual inspections of equipment condition, wiring, splicing, cabling, mounting and placement of equipment, hardware and adherence to safety procedures. These inspections shall ensure compliance with specified installation criteria. The Contractor shall conduct a final inspection that encompasses all phases of the installed project. This inspection shall include a review of the "as-built" provided by the Contractor. The Contractor shall correct any areas not in compliance with the contract specifications and drawings as revealed by these inspections. Following correction, a re-examination of previously non-compliant items may be conducted at the discretion of the Contracting Officer.

3.6.1 Unshielded Twisted Pair Tests

All metallic cable pairs shall be tested for proper identification and continuity. All opens, shorts, crosses, grounds, and reversals shall be corrected. Correct color coding and termination of each pair shall be verified at all terminating hardware and at the outlet. Horizontal wiring shall be tested from and including the termination device at the telephone backboard to and including the modular jack in each room. Wiring shall be tested end-to-end, including termination devices and jacks. These test shall be completed and all errors corrected before any other tests are started. All installed cable shall be tested for attenuation loss at 100Mhz with results reported in dB and shall be tested in both directions for NEXT at 100Mhz and results reported. All test results shall be supplied in hard copy to the Contracting Officer.

3.6.2 Category 5e Circuits

All category 5e circuits shall be tested using a test set that meets the Class II accuracy requirements of TIA/EIA TSB 67 standard, including the additional tests and test set accuracy requirements of ANSI/TIA/EIA-568-A-5. Testing shall use the Basic Link Test procedure of TIA/EIA TSB 67, as supplemented by ANSI/TIA/EIA-568-A-5. Cables and connecting hardware which contain failed circuits shall be replaced and retested to verify the standard is met.

3.6.3 Grounding

All grounds and bonds shall be tested for continuity according to EIA/TIA -607 and results reported in hard copy. Grounds shall be labeled and tagged in accordance with EIA/TIA-606.

-- End of Section --

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		01330	SD-01 Preconstruction Submittals														
			Submittal register	1.5.1	G												
		01355A	SD-01 Preconstruction Submittals														
			Environmental Protection Plan	1.7	G												
		01780	SD-11 Closeout Submittals														
			As-Built Drawings	1.2.1	G												
			As-Built Record of Equipment and Materials	1.2.2													
			Final Approved Shop Drawings	1.2.3	G												
			Construction Contract	1.2.4													
			Specifications														
			Real Property Equipment;	1.2.5													
			Warranty Management Plan	1.3.1	G												
			Warranty Tags	1.3.5													
			Final Clean-Up														
		02210	SD-06 Test Reports														
			Soils Tests	3.16													
		02220a	SD-03 Product Data														
			Work	1.2	G												
		02226	SD-03 Product Data														
			Work	1.1	G												
		02300a	SD-06 Test Reports														
			Testing	3.11													
			SD-07 Certificates														
			Testing	3.11													
		02315a	SD-06 Test Reports														

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		02315a	Testing	3.13													
		02316a	SD-06 Test Reports														
			Field Density Tests	3.4.3													
			Testing of Backfill Materials	3.4.2													
		02364A	SD-03 Product Data														
			Termiticide Application	3.2.1													
			Termiticides	2.1													
			Foundation Exterior	3.2.3													
			Utilities and Vents	3.2.4													
			Crawl and Plenum Air Spaces	3.2.5													
			Verification of Measurement	3.5													
			Application Equipment	3.4.1													
			SD-04 Samples														
			Termiticides	2.1	G												
			SD-06 Test Reports														
			Equipment Calibration and Tank	3.4.1													
			Measurement														
			Soil Moisture	3.3.1													
			SD-07 Certificates														
			Qualifications	1.2													
		02531a	SD-07 Certificates														
			Portland Cement	2.5.1													
			Joints	2.3													
		02532a	SD-06 Test Reports														
			Hydrostatic Tests	3.2													
		02571	SD-05 Design Data														

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		02571	Mix	2.1.1													
			SD-07 Certificates														
			Aggregates														
			Bituminous Mixture														
		02770a	SD-03 Product Data														
			Concrete	2.1													
			SD-06 Test Reports														
			Field Quality Control	3.8													
		02921N	SD-03 Product Data														
			Fertilizer	2.5													
			SD-06 Test Reports														
			Topsoil composition tests	2.2.4													
			SD-07 Certificates														
			seed	2.1													
			SD-08 Manufacturer's Instructions														
			Erosion Control Materials	2.8													
		03307a	SD-03 Product Data														
			Air-Entraining Admixture	2.1.3.1													
			Accelerating Admixture	2.1.3.2													
			Water-Reducing or Retarding	2.1.3.3													
			Admixture														
			Curing Materials	2.1.11													
			Reinforcing Steel	2.1.5													
			Expansion Joint Filler Strips,	2.1.6													
			Premolded														

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		03307a	Joint Sealants - Field Molded Sealants	2.1.7													
			Batching and Mixing Equipment	3.1.5.3													
			Conveying and Placing Concrete	3.2													
			Formwork	2.1.8													
			SD-06 Test Reports														
			Aggregates	2.1.2													
			Concrete Mixture Proportions	1.3.3													
			SD-07 Certificates														
			Cementitious Materials	2.1.1													
			Aggregates	2.1.2													
		03900	SD-07 Certificates														
			Materials	2.1	G												
		04200a	SD-02 Shop Drawings														
			Masonry Work	1.3.4													
			SD-03 Product Data														
			Clay or Shale Brick	2.2													
			SD-04 Samples														
			Prefaced Concrete Masonry Units	3.2.4													
			Anchors, Ties, and Bar	2.7													
			Positioners														
		04900	SD-03 Product Data														
			Cleaning and Restoration	1.2.1	G												
			Methods														
			Qualifications	1.4													
			SD-07 Certificates														

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		04900	Materials	2.1													
		05500a	SD-04 Samples														
			Miscellaneous Metal Items	1.6													
		06100a	SD-02 Shop Drawings														
			Structural Wood Members	2.1.5													
			Installation of Framing	3.1													
		06200a	SD-02 Shop Drawings														
			Finish Carpentry														
			Handrails														
			Stair pickets														
			SD-04 Samples														
			Handrails														
			Stair pickets														
			Screen wire	2.4													
		06650	SD-02 Shop Drawings														
			Shop Drawings	2.3													
			Installation	3.2													
			SD-03 Product Data														
			Solid polymer material	2.1													
			Qualifications	1.6													
			Fabrications	2.3													
			SD-04 Samples														
			Material	2.1	G												
			Counter Tops	2.3.4													
			SD-06 Test Reports														
			Solid polymer material	2.1													

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		06650	SD-07 Certificates														
			Fabrications	2.3													
			Qualifications	1.6													
			SD-10 Operation and Maintenance Data														
			Solid polymer material	2.1													
			Clean-up	3.3													
		07110A	SD-07 Certificates														
			Materials	1.4													
		07161N	SD-04 Samples														
			Metallic waterproofing	1.4													
			SD-06 Test Reports														
			Iron content	1.3													
			Oxidizing agent content	1.3													
			SD-08 Manufacturer's Instructions														
			Mixing	3.3													
		07214N	SD-03 Product Data														
			Block or board insulation	2.1													
			SD-08 Manufacturer's Instructions														
			Block or Board Insulation	2.1													
			Adhesive	2.2.1													
		07310	SD-03 Product Data														
			Qualifications	1.3	G												
			SD-04 Samples														
			Slate	2.1.2	G												
			Accessories for Slate Roofs	3.8													

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		07310	Sealants														
			Underlayment Membrane	2.1.3													
			Fasteners	3.2													
			SD-07 Certificates														
			Materials	2.1													
		07311A	SD-03 Product Data														
			Application of Roofing Materials	3.2													
			SD-04 Samples														
			Shingles	2.1.6	G												
		07600a	SD-02 Shop Drawings														
			Materials	2.1													
		07840A	SD-02 Shop Drawings														
			Firestopping Materials	2.1													
			SD-07 Certificates														
			Firestopping Materials	2.1													
			Installer Qualifications	1.5													
			Inspection	3.3													
		07900A	SD-03 Product Data														
			Backing	2.1													
			Bond-Breaker	2.2													
			Sealant	2.4													
			SD-07 Certificates														
			Sealant	2.4													
		08110	SD-02 Shop Drawings														
			Doors	2.1													
			Doors	2.1													

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		08110	Frames	2.6													
			Frames	2.6													
			Accessories	2.4													
			SD-03 Product Data														
			Doors	2.1	G												
			Frames	2.6													
			Accessories	2.4													
		08181	SD-02 Shop Drawings														
			Storm doors	2.1.4													
			SD-03 Product Data														
			Storm doors	2.1.4													
			Hardware	2.1.4.1													
			SD-04 Samples														
			Storm doors	2.1.4													
			finishes	2.3	G												
			SD-06 Test Reports														
			Storm doors	2.1.4													
			SD-10 Operation and Maintenance														
			Data														
			Storm doors	2.1.4													
		08210	SD-02 Shop Drawings														
			Doors	2.1	G												
			SD-03 Product Data														
			Doors	2.1	G												
			Accessories	2.2													
			Water-resistant sealer	3.1													

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		08210	SD-04 Samples														
			Doors	2.1													
		08361	SD-02 Shop Drawings														
			Doors	2.2													
			SD-03 Product Data														
			Doors	2.2													
			SD-08 Manufacturer's Instructions														
			Doors	2.2													
			SD-10 Operation and Maintenance														
			Data														
			Doors	2.2													
		08520A	SD-02 Shop Drawings														
			Aluminum Windows	2.1													
			SD-03 Product Data														
			Aluminum Windows	2.1													
			SD-04 Samples														
			Aluminum Windows	2.1													
			SD-06 Test Reports														
			Aluminum Windows	2.1													
			SD-07 Certificates														
			Aluminum Windows	2.1													
		08550	SD-02 Shop Drawings														
			Wood windows	2.1													
			SD-03 Product Data														
			Wood windows	2.1													
			SD-08 Manufacturer's Instructions														

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		08550	Wood windows	2.1													
			SD-10 Operation and Maintenance Data														
			Wood windows	2.1													
		08710	SD-02 Shop Drawings														
			Hardware schedule	1.3													
			Keying system	2.3.4													
			SD-03 Product Data														
			Hardware items	2.3	G												
			SD-08 Manufacturer's Instructions														
			Installation	3.1													
			SD-10 Operation and Maintenance Data														
			Hardware Schedule	1.3													
			SD-11 Closeout Submittals														
			Key bitting	1.4													
		08810A	SD-02 Shop Drawings														
			Installation	3.2													
			SD-03 Product Data														
			Glass	2.1													
			Glazing Accessories	2.6													
			SD-04 Samples														
			Glass	2.1													
			SD-07 Certificates														
			Glass	2.1													
		09215A	SD-03 Product Data														

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		09215A	Materials	2.1													
			SD-07 Certificates														
			Fire Resistive Construction	1.7													
		09225A	SD-03 Product Data														
			Materials	1.3													
		09250	SD-03 Product Data														
			Cementitious backer units	2.1.4													
			Glass Mat Water-Resistant	2.1.3													
			Gypsum Tile Backing Board														
			Water-Resistant Gypsum Backing Board	2.1.2													
			Accessories	2.1.8													
			SD-07 Certificates														
			Asbestos Free Materials	2.1													
		09310A	SD-03 Product Data														
			Tile	2.1													
			Setting-Bed	2.2													
			Mortar, Grout, and Adhesive	2.4													
			SD-04 Samples														
			Tile	2.1	G												
			Accessories	2.1.2	G												
			Marble Thresholds	2.5	G												
			SD-07 Certificates														
			Tile	2.1													
			Mortar, Grout, and Adhesive	2.4													
		09562	SD-02 Shop Drawings														

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		09562	Refurbishment		G												
			SD-03 Product Data														
			Operating Instructions														
			SD-07 Certificates														
			Restorer Qualifications														
		09640A	SD-03 Product Data														
			Installation	3.1													
			SD-04 Samples														
			Strip Flooring	2.1	G												
		09650A	SD-03 Product Data														
			Resilient Flooring and														
			Accessories														
			SD-04 Samples														
			Flooring	3.2	G												
		09680A	SD-03 Product Data														
			Carpet	2.1													
			Surface Preparation	3.1													
			Installation	3.3													
			SD-04 Samples														
			Carpet	2.1	G												
			Molding	2.3													
			SD-07 Certificates														
			Carpet	2.1													
			SD-10 Operation and Maintenance														
			Data														
			Carpet	2.1													

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		09680A	Cleaning and Protection	3.4													
		09900	SD-03 Product Data														
			Coating	2.1	G												
			SD-04 Samples														
			Color	1.9	G												
			SD-07 Certificates														
			Applicator's qualifications	1.3													
			SD-08 Manufacturer's Instructions														
			Application instructions	3.3.1													
			Mixing	3.7.2													
			Manufacturer's Material Safety														
			Data Sheets														
			SD-10 Operation and Maintenance														
			Data														
			Coatings:	2.1													
		09995	SD-03 Product Data														
			Work Plan	1.2													
			Materials	1.2													
			Qualifications	1.7													
			SD-07 Certificates														
			Work Plan	1.2													
		10201N	SD-02 Shop Drawings														
			Wall louvers	2.2													
			SD-04 Samples														
			Wall louvers	2.2	G												
			Door louvers	3.1.2	G												

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		10300	SD-03 Product Data														
			Gas Logs	2.1													
		10800A	SD-03 Product Data														
			Finishes	2.1.2													
			Accessory Items	2.2													
			Frameless Shower Enclosure	2.3													
			SD-04 Samples														
			Finishes	2.1.2	G												
			Accessory Items	2.2	G												
		11401N	SD-03 Product Data														
			Kitchen equipment	2.1													
			SD-08 Manufacturer's Instructions														
			Kitchen equipment	2.1													
		12320	SD-02 Shop Drawings														
			Cabinets	2.2													
			Countertops	2.3													
			SD-03 Product Data														
			Cabinets	2.2													
			Countertops	2.3													
			SD-04 Samples														
			Cabinets	2.2													
			Countertops	2.3	G												
			SD-06 Test Reports														
			Cabinets	2.2													
			Countertops	2.3	G												
			SD-07 Certificates														

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		12320	Cabinets	2.2													
			Countertops	2.3													
		12490A	SD-03 Product Data														
			Window Treatments	3.2													
			Hardware	1.3													
			SD-04 Samples														
			Window Treatments	3.2	G												
		13280	SD-03 Product Data														
			Respiratory Protection Program	1.12	G												
			Cleanup and Disposal	3.11	G												
			Materials and Equipment														
			Qualifications	1.5	G												
			Training Program	1.11													
					03												
			Medical Requirements	1.10													
			Encapsulants	2.1	G												
			SD-06 Test Reports														
			Exposure Assessment and Air	3.9	G												
			Monitoring														
			Local Exhaust Ventilation	1.20													
			Licenses, Permits and	1.14													
			Notifications														
			SD-07 Certificates														
			Vacuum, Filtration and Ventilation														
			Equipment														
		13281	SD-03 Product Data														

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		13281	Materials and Equipment	1.18													
			Expendable Supplies	1.19													
			Qualifications	1.5	G												
			SD-06 Test Reports														
			Licences, Permits, and	1.11													
			Notifications														
			Accident Prevention Plan (APP)	1.7	G												
			Sampling and Analysis	1.13													
			Clearance Report	3.8													
		15080A	SD-04 Samples														
			Thermal Insulation Materials														
		15190A	SD-02 Shop Drawings														
			Gas Piping System	3.2													
			SD-03 Product Data														
			Qualifications														
		15400A	SD-02 Shop Drawings														
			Plumbing System	3.6.1													
			SD-03 Product Data														
			Plumbing Fixture Schedule	3.7	G ED												
			Plumbing System	3.6.1													
			SD-07 Certificates														
			Materials and Equipment														
			SD-10 Operation and Maintenance														
			Data														
			Plumbing System	3.6.1													
		15566A	SD-02 Shop Drawings														

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		15566A	Heating Equipment		G ED												
			Installation	3.1													
			SD-03 Product Data														
			Heating Equipment		G												
			Tests	3.4													
			System Diagrams														
			Similar Services														
			Field Training	3.5													
			SD-10 Operation and Maintenance														
			Data														
			Heating Equipment														
		15700A	SD-02 Shop Drawings														
			Drawings		G												
			SD-03 Product Data														
			Air Conditioning System		G												
			Spare Parts Data														
			Posted Instructions	3.6													
			Verification of Dimensions	1.5.1													
			SD-06 Test Reports														
			Refrigerant Tests, Charging, and														
			Start-Up														
			System Performance Tests	3.4													
			SD-07 Certificates														
			Air Conditioning														
			Service Organization	2.1													

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		15700A	SD-10 Operation and Maintenance														
			Data														
			Operation Manuals														
			Maintenance Manuals	3.6													
		15895A	SD-02 Shop Drawings														
			Drawings		G												
			SD-03 Product Data														
			Components and Equipment	2.1													
			Test Procedures														
			Similar Services														
			Testing, Adjusting and Balancing	3.4													
			Field Training														
			SD-06 Test Reports														
			Performance Tests														
		15990A	SD-02 Shop Drawings														
			TAB Schematic Drawings and	3.3	G												
			Report Forms														
			SD-03 Product Data														
			TAB Procedures	3.5.1	G												
			Calibration	1.4	G												
			Systems Readiness Check	3.5.2													
			TAB Execution	3.5.1	G												
			TAB Verification	3.5.4	G												
			SD-06 Test Reports														
			Design Review Report	3.1	G												
			Systems Readiness Check	3.5.2	G												

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		15990A	TAB Report	3.5.3	G												
			TAB Verification Report	3.5.4	G												
			SD-07 Certificates														
			Ductwork Leak Testing	3.4	G RE												
			TAB Firm	1.5.1													
			TAB Specialist	1.5.2													
		16273N	SD-02 Shop Drawings														
			Pad-mounted transformer drawings	1.4.1	G												
			SD-03 Product Data														
			Single-phase pad-mounted transformers (dead-front)	2.2	G												
			SD-06 Test Reports														
			Acceptance checks and tests	3.6.1	G												
			SD-07 Certificates														
			Transformer losses	1.4.2	G												
			SD-09 Manufacturer's Field Reports														
			design tests	2.6.2	G												
			routine and other tests	2.6.3	G												
			SD-10 Operation and Maintenance Data														
			Transformer(s)	1.5.1	G												
			SD-11 Closeout Submittals														
			Transformer test schedule	2.6.1	G												
		16375A	SD-02 Shop Drawings														

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		16375A	Electrical Distribution System	3.9.3													
			As-Built Drawings														
			Nameplates	2.2													
			Material and Equipment	2.1													
			General Installation Requirements	3.1													
			SD-06 Test Reports														
			Factory Tests	2.15													
			Field Testing	3.9													
			Operating Tests	3.9.8													
			Cable Installation	3.2.1.4													
			SD-07 Certificates														
			Material and Equipment	2.1													
			Cable Joints	3.3													
			Cable Installer Qualifications														
			SD-10 Operation and Maintenance														
			Data														
			Electrical Distribution System	3.9.3													
		16415A	SD-02 Shop Drawings														
			Interior Electrical Equipment														
			SD-03 Product Data														
			Manufacturer's Catalog		G												
			Material, Equipment, and Fixture		G												
			Lists														
			Installation Procedures		G												
			As-Built Drawings	1.2.6	G												
			Onsite Tests		G												

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		16415A	SD-06 Test Reports														
			Factory Test Reports		G												
			Field Test Plan		G												
			Field Test Reports	3.19	G												
			SD-07 Certificates														
			Materials and Equipment	1.4													
			FIO														
		16710A	SD-02 Shop Drawings														
			Premises Distribution System	1.7	G												
			Record Drawings		G												
			SD-03 Product Data														
			Record Keeping and	1.8	G												
			Documentation														
			Spare Parts														
			Manufacturer's Recommendations	3.1.2	G												
			Test Plan		G												
			Qualifications	1.4	G												
			SD-06 Test Reports														
			Test Reports														
			SD-07 Certificates														
			Premises Distribution System	1.7													
			Materials and Equipment	2.1	G												
			Installers		G												